

# THE GAZETTEER OF INDIA

## INDIAN UNION

Volume One  
COUNTRY AND PEOPLE

THE CENTRAL GAZETTEERS UNIT  
GOVERNMENT OF INDIA

PREFACE  
BY  
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## PREFACE

From the earliest times, man has sought to acquire knowledge of his immediate environment, partly in order to survive but also partly because of his innate curiosity. In course of time, this led him to undertake a study of his own country and record his impressions in various tangible forms. He did not rest there, but went on to acquire and preserve information about other countries as well. Travellers' accounts that describe geographical features and various aspects of social, political and economic life of lands and peoples became a recognised form of literature quite early in history. Soon, such accounts were organised in what may be called Gazetteers or Geographical Dictionaries. Today, their scope has been expanded further so as to cover the physical features and the history of a country as well as social, political and economic life of the people inhabiting it.

We know that Scylax in the sixth century before Christ and some two hundred years later, Megasthenes had written accounts of India, though they now exist only in fragments quoted by other authors. Kautilya's (*Cāṇakya*) *Arthaśāstra* provides invaluable geographical and statistical information about India in the Mauryan age. Fa-Hien and Hiuen Tsang and later Ibn Batūta have also left valuable records of their impressions about the country and the people. The earliest known work that approximates to a gazetteer or geographical dictionary is, however, the work of Stephen of Byzantium in the sixth century after Christ. The Domesday Book compiled for William the Conqueror is also an interesting anticipation of the modern gazetteer. Nor must we forget Albéruni's *Indica* which is a model of careful observation and scientific analysis.

None of these works can however be regarded as gazetteers in the modern sense, though *Aīn-i-Akbarī* compiled by Abul Fadl satisfies the test of objectivity and careful study and research. W. W. Hunter, the Editor of the first two editions of *The Imperial Gazetteer of India*, stated that he had as models before him the *Aīn-i-Akbarī* and the Military Survey of Egypt conducted by France in the first quarter of the 19th century. He describes the *Aīn-i-Akbarī* as "a masterpiece of administrative detail" and the Military Survey as a "brilliant effort of organised research". Though these earlier attempts have won admiration from scholars throughout the world, the distinction of being the first full-fledged and modern gazetteer should perhaps go to the *Geographisch*

*statistisches Handwörterbuch*, published in 1817 by the German geographer, Johann G. H. Hassel.

The growth of gazetteer literature in Europe was a part of the new intellectual awakening that followed the Renaissance and the Industrial Revolution. Europeans not only spread to far corners of the world, but also developed a new curiosity into all spheres of experience. For the British who came to India, this desire for knowledge was reinforced by the requirements of the political situation. They were aliens totally unfamiliar with local conditions and yet they had to administer large areas of the country over which they had established their dominion. Exigencies of administration compelled them to undertake the preparation of surveys—general, military, revenue and statistical—in different parts of the country under official and semi-official auspices. The accounts of observant foreign travellers further enriched the stock of information collected through these sources.

Of the vast literature which thus grew up, mention need only be made of Col. Mackenzie's *Surveys*, Logan's *Malabar*, Buchanan's *A Journey from Madras through the countries of Mysore, Canara and Malabar* and volumes on the Statistical Survey of India. Soon there began to appear regular gazetteers by private authors. Walter Hamilton's *East India Gazetteer* was first published in 1815. Edward Thornton published his *Gazetteer of the Territories under the Government of the East India Company* in 1854. Till the publication of the first edition of *The Imperial Gazetteer of India* in 1881 Thornton's was the best known work on India for both the specialist and the general reader.

In addition to these general accounts, the preparation of *District Statistical Accounts* was taken in hand even before the Indian Revolt of 1857. It was however in 1866 that Richard Temple in the Central Provinces took the lead in preparing and publishing official gazetteers for districts in the accepted sense of the term. A large number of District Manuals and Gazetteers followed in rapid succession, but the efforts of the Provincial Governments were uncoordinated and therefore not fully satisfactory. In 1871, the Government of India accepted W. W. Hunter's comprehensive plan for the preparation of the Gazetteers under central authority.

Hunter has given an account of the way in which he set about his task. As one reads his Preface, one is struck by the similarity of the problems which the editor of a Gazetteer of India faces today. Editors for different provincial gazetteers had their own ideas about the way the work should be done. Those who wrote the District Gazetteers were at times more concerned with local

matters than national problems. A happy blend of the scholar and the administrator enabled Hunter to overcome all difficulties and the first edition of *The Imperial Gazetteer of India* was published in 1881 in nine volumes. The companion volume, *The Indian Empire : Its History, People and Products*, appeared in 1882. The fresh data available after the Census of 1881 and the rapid changes occurring in the life of the country led to the issue of a second edition of *The Imperial Gazetteer* in 1885-1887, in fourteen volumes.

*The Imperial Gazetteer* was immediately accepted as an authoritative and comprehensive study of India in all the richness of her life and culture. In fact, it was generally agreed that perhaps no other country could boast of such a thorough and exhaustive account of the country and its people. In spite of all its virtues, it became outdated and in many respects unsatisfactory by the beginning of the present century. Lord Curzon has been criticised for many of his political acts, but no one can deny that he made the Indian Government alive to the need of encouraging intellectual and cultural activities. Mainly due to his interest and inspiration, the new revised edition of the Gazetteer was issued in 1907-1909 in 26 volumes. The first four volumes were a revised version of Hunter's *The Indian Empire*. The next twenty constituted the alphabetical series and the last two the Index and the Atlas.

One new feature of the new edition of the Gazetteer was that in addition to the India volumes, a Provincial series with the Provinces as units and a District Gazetteer series with the Districts as units were also issued. The developments in the then British India had their effect on the princely States and led to the publication of important works like *The Travancore State Manual*, *The Cochin State Manual* and *The Mysore Gazetteer*. After the colossal effort involved in preparing the volumes, no fresh survey was undertaken for many decades and supplementary statistical volumes alone were issued from time to time. The Curzon-inspired edition of the Gazetteer, most of it produced over 50 years back, has thus continued till today to be the only handy reference book available to administrators, scholars and the public on all matters relating to life in India.

The life of a people never stands still. Any account of a country, and a gazetteer is no exception, must therefore be revised from time to time. Apart from any other reasons, this is necessary so that its statistical and other information reflects existing conditions correctly. The lapse of half a century would have by itself provided sufficient reason for undertaking a further revision of *The Imperial Gazetteers*, but in addition, these fifty years

have seen revolutionary changes in India and outside. The great empires which in the first decade of the century seemed as permanent as the hills, no longer exist. Asia is free and Africa is emerging as a major force in world affairs. Colonialism has almost disappeared from the face of the earth. Science and technology are transforming old economic and social institutions and posing new challenges to man's deepest beliefs and faith.

Against this background of a changing world, the whole fabric of Indian life has changed almost out of recognition. The national struggles which ultimately led to the achievement of Independence, the Industrial developments since the first World War, the enormous expansion in education and the spread of democratic and egalitarian ideals have led to vast changes in the mental and moral attitude of the people. These demand radical revisions in our account of the social and political life of the country, but even the description of the land and its configuration and climate have to be rewritten in the light of the enormous expansion in our knowledge about the physical characteristics of the earth. As such, even the chapters on geology written by some of the most competent experts of the time require to be revised and brought up to date.

The changes mentioned above relate to questions of fact, but perhaps of even greater importance is the question of a new approach. The earlier India Gazetteers were written primarily for the use of British administrators and the outlook was often coloured by the imperialist interests of Britain. The Gazetteers today have an even more important role, for under modern Indian conditions, the administrators are not a few hand-picked men of proven ability but an entire people. In 1869, Hunter had written to the Viceroy of the day, "Nothing, nothing is more costly to a Government than ignorance." This is a truth which applies with equal, even greater force, to the civilians of today. Administration even fifty years ago was mainly a question of maintaining law and order. Today, it touches every aspect of life and there is real risk that administrators may lose themselves in the vast expanse of the bureaucratic machinery which has developed as a result of the ever increasing responsibilities of Government.

The need for revising the Gazetteers was widely felt after the achievement of Independence, but the credit for taking the first step goes to Bombay which started the work of revision in 1949 and published a volume on Poona in 1954. West Bengal issued District Census Handbooks in 1953 with lengthy introductions furnishing information that is normally included in Gazetteers. Bihar began the work in 1952 and published two District

Gazetteers on Gaya and Hazāribāgh in 1957. Madras began in 1954 and brought out the volume on Tanjore in 1957. Rājasthān and Uttar Pradesh entered the field in 1953 and 1957 respectively and since then most State Governments have set up machinery for the revision of the District Gazetteers.

The lead taken by the State Governments deserves the highest praise but there was a risk that uncoordinated and independent efforts by the different States may lead to results not commensurate with the effort. The Gazetteers are most useful when they follow a uniform pattern so that users from different parts of the country or outside can find out the information they seek without undue waste of time and energy. Accordingly, a central scheme for revision of the gazetteers was taken in hand and the late Maulānā Abul Kalām Azād reported this to Parliament in April 1951. Discussions at various levels were followed by a conference of representatives of the State Governments and of the various Ministries of the Government of India in July 1955. The Conference expressed itself in the following terms : "The Gazetteers were conceived and devised to meet a particular and limited need under the British regime, but they are nevertheless a storehouse of authentic information in a convenient form and of great value for the general public and particularly for those concerned with administration." The hope which Hunter expressed in 1876 that the Gazetteers would constitute "a monument of the administration under which it may be composed, more profitable than the conquest of a new Province" has thus been amply fulfilled.

Once it was agreed that the India Gazetteers should be revised and brought up to date, two alternatives offered themselves. The first was to use the existing gazetteers and make only such changes as were inescapable. The other was to plan the work entirely anew on the basis of the new knowledge and the new needs of the day. The ultimate decision was a twofold plan under which the Central Government would be responsible for the India volumes, while the State Governments would undertake the revision or new compilation of District Gazetteers according to necessity. The old "Indian Empire" volumes were to be revised, re-written and amplified so as to deal with important developments during the present century and exclude such portions as are no longer necessary or useful. The alphabetical volumes of the series were not to be re-issued, but there was to be instead a comprehensive all-India index of the District Gazetteers. The District Gazetteers were to be the responsibility of the State Governments who would revise and bring up to date gazetteers where they exist and arrange for the compilation and publication of gazetteers for

districts which at present have none. The preparation of the State Gazetteers on the model of the old provincial gazetteers was to be considered after the work on the District Gazetteers was completed. The whole of the Gazetteer work was to be "planned as a single co-ordinated unit, with a uniformity of form, content and standard, but providing room for variations and additions to meet local or special needs."

Following the decisions of the Conference, an Expert Committee drew up a detailed plan in November 1955, and the revision of the Gazetteers was included among the Central Schemes for the Second Five Year Plan. The Central Gazetteers Unit was constituted in January, 1958, to co-ordinate the work of the State Units as well as to undertake the preparation of the Central volumes. To aid and advise the Central Unit, a Central Advisory Board was constituted in February 1958, and held meetings in March and September that year to consider and approve plans for the India volumes. As the absence of a General Editor was interfering with the progress of the work, the Central Advisory Board was reconstituted in August 1959 with Shri Humayun Kabir as Chairman and given a more direct responsibility for the execution of the plan. The reconstituted Central Advisory Board whose composition is given elsewhere considered and approved the plan and the list of contributors for the first volume in September 1959. It had been originally proposed that it should be published by the end of 1960, but the Board decided that, since the gazetteers are revised only after long periods, publication should be deferred in order to incorporate the results of the Decennial Census in March 1961. In the meantime, the Board continued with its work on the second volume, and the plan and the list of contributors were approved at its meetings held in January and April 1961.

Without a thorough revision of the District Gazetteers, the picture painted by the India Gazetteers would necessarily remain sketchy and at times inadequate. It is gratifying to note that all the State Governments and Union Territories excepting Jammu and Kashmir have adopted the scheme and taken up the work in earnest. It is expected that the Government of Jammu and Kashmir will also begin the work during the current year. The results achieved so far have been uneven as different State Governments entered the picture at different times. The work is however gathering momentum everywhere. Conferences of the State Editors who have met from time to time to evolve an agreed plan and exchange ideas have helped to resolve difficulties and expedite the work. Thirty-six Gazetteers have already been published, and

thirty-six more have been approved and are awaiting publication. Since the total number of District Gazetteers will be over three hundred, the major part of the work still remains to be done. It will be our endeavour to complete the project before the end of the Third Plan, but it would be better to exceed the time limit by even a year than complete the work in a hasty and shoddy fashion.

The revised version of *The Imperial Gazetteer of India* for which the Government of India have assumed the responsibility is entitled *The Gazetteer of India: Indian Union*. It will be published in four volumes, viz. Vol. I : *Country and People*, Vol. II : *History and Culture*, Vol. III : *Economic Structure and Activities* and Vol. IV : *Administration and Public Welfare*. Each chapter and where necessary a section of a chapter, will be contributed by a specialist in his own field, but the overall responsibility for compilation will be the responsibility of the Central Gazetteers Unit.

The new Gazetteers are intended to educate not only the administrators but the people in whose hands power ultimately rests. They must be true to facts but at the same time reflect the thoughts, ideals and aspirations of independent India. In a country like India, it is essential that members of each constituent community should learn to know and respect the life and culture of the many other constituent units. The Gazetteers must, from their very nature, provide all with the knowledge of this rich variety and at the same time bring out the basic similarities underlying the outward differences. Social, economic and political inequalities have been the causes of India's misfortunes in the past. Nationwide poverty, illhealth and ignorance can be eradicated only through national planning guided by the principles of secularism, democracy and socialism. The gazetteers can educate the public in these regards and also play an important role in reconciling local patriotism with love and loyalty for India and the world.

The gazetteer must from the nature of the case be a co-operative effort of many scholars, administrators and compilers. I should like to make special mention of Maulānā Abul Kalām Azād under whose leadership the work began and of Shri Balwantrai Mehta who helped greatly in securing the cooperation of the State Governments. Dr. S. B. Chaudhuri was engaged in the work of planning from the outset and Dr. Bhabani Bhattacharya has acted as a reader and literary editor for the present volume. Shri A. K. Ghosh, I. C. S., has been in overall charge of the project and the Editors and their colleagues in the Central Gazetteers Unit have worked hard for the success

of the scheme. Our thanks are also due to the Publications Division of the Ministry of Information and Broadcasting who are publishing it for us.

Last but not least, I am personally grateful to the members of the Central Advisory Board and the distinguished contributors without whose advice, help and cooperation this work could not have been accomplished.

New Delhi,  
31 December, 1964

Humayun Kabir

## INTRODUCTORY NOTES

The system of transliteration followed in this volume is the one in the Table of Transliteration in *The Indian National Bibliography*, Central Reference Library, India. There are, however, a few deviations, (but not in the case of Urdu) such as za for ज, रा for र, and झा for झ (Hindi); and ता or धा; शा or शा; and रा or रा, depending on pronunciation of the corresponding Tamil consonant. Attempt has generally been made to distinguish between the long and short sounds for e and o in the Panjabī and Dravidian languages. Some words and names have been spelt in the conventional way, e.g., 'Panchāyat', 'Chhorten', 'Shah', 'Chandra', 'Chatterji', 'Ramakrishna', 'Ishwar' etc. Diacritical marks have not been used for names of recent persons.

## PRONUNCIATION

### Vowel Sounds

a	—	like u in 'cut'
ā	—	like a in 'father'
i	—	like i in 'tin'
ī	—	like ī in 'police'
u	—	like u in 'bulb'
ū	—	like u in 'rude'
e	—	like e in 'grey'
ē	—	like ea in 'great'
r	—	like ri in 'ring'
ai	—	like ī in 'mine'
o	—	like o in 'bone'
ō	—	like o in 'potent'
au	—	like ou in 'mouse'

### Consonants

k	—	has the sound of k in 'kind'
kh	—	has the sound of kh in 'inkhom'
g	—	has the sound of g in 'game'
gh	—	has the sound of gh in 'ghutto'
n	—	has the sound of n in 'sing'

c	—	has the sound of ch in ‘church’
ch	—	has the sound of chh in ‘churchhill’
j	—	has the sound of j in ‘jump’
jh	—	has the sound of dgeh in ‘hedgehog’
ñ	—	has the sound of n in ‘singe’
t	—	has the sound of t in ‘ticket’, ‘temerity’
th	—	has the sound of th in ‘port-hole’
d	—	has the sound of d in ‘bird’
dh	—	has the sound of dh in ‘bird-house’
ñ	—	has the sound of n in ‘round’
t	—	has the sound of t in ‘third’
th	—	has the sound of th in ‘hit-hard’
d	—	has the sound of d in ‘dinari’
dh	—	has the sound of dh in ‘madhouse’
n	—	has the sound of n in ‘number’
p	—	has the sound of p in ‘pun’
ph	—	has the sound of ph in ‘up-hill’
b	—	has the sound of b in ‘bank’
bh	—	has the sound of bh in ‘abhor’
m	—	has the sound of m in ‘mud’
y	—	has the sound of y in ‘yes’
v	—	has the sound of v in ‘vent’
ś	—	has the sound of sh in ‘ship’
ʂ	—	has the sound of sh in ‘should’
l	—	has the sound of l in ‘lull’

In the case of current geographical names, the Survey of India system of spelling and diacritical marks has generally been followed. Ancient place names, however, carry full diacritical marks e.g., Kauśāmbī, Nāgārjunikonda, Drṣadvatī, etc.

Words in Indian languages other than proper nouns or those which have come into common use in English or represent a class of literature, cult, sect or school of thought, are italicised. Words which could not be italicised for want of type-faces have been enclosed in single inverted commas.

In order to avoid overcrowding, diacritical marks have not been used in the Political Map of India.

No glossary is given as obstruse, obsolete, local and technical terms have been explained in the text itself.

The metric system of weights and measures has been adhered to.

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## CHAPTER I

### PHYSIOGRAPHY

#### 1. *Introduction*

INDIA IS A LAND of lofty mountains and mighty rivers. No other country in the world is richer in scenic grandeur and the panorama of contrasting landscapes at different stages of evolution. The location of India in a southern peninsula of the Asian continent and the triangular shape tapering southwards to the Indian Ocean give it a distinctive character, both physical and cultural. India covers an area of 3,267,500 sq. km. the mainland extending from south to north for 3,200 km. between  $8^{\circ}4'$  and  $37^{\circ}6'$  North parallels of latitude and from west to east for 3,000 km. between  $68^{\circ}7'$  and  $97^{\circ}25'$  East meridians of longitude. While it ranks as the world's seventh largest country, no other country except the Soviet Union and the United States surpasses it in the extent of arable land. In population, about 439 millions (1961), it is the second largest, next only to China. With a land frontier of 15,200 km. and a coastline of 5,700 km. India may well be called a subcontinent. Each of the sixteen States, ten Union Territories and other areas into which the country is divided for administrative purposes has a physiographic charm of its own.

The Himālayan landscape with its majestic snow-clad peaks, vast ice-fields above the heads of large valley glaciers, roaring waterfalls over high precipices, deep river gorges and broad valleys is well represented in Kashmīr and Hīmāchal Pradesh, as also in the northern regions of Punjab, Uttar Pradesh, West Bengal and Assam. Kashmīr's fascination is centred on its valley, through which the Jhelum meanders amidst lakes, floating gardens and terraced saffron fields. Many picturesque spots occur in the Baspa valley in Hīmāchal Pradesh, Kulu and Kāngra in Punjab, and the Nanda Devi group of mountains in Uttar Pradesh. Sikkim has a beautiful Himālayan peak, Siniolchu (6,895 m.). A magnificent view of the snow-covered Kānchenjunga is obtained from Darjeeling in West Bengal. Bhutān also presents a splendid view of peaks, especially Kula Kangri (7,554 m.) near the glacial pass of Monla Karchung. In the NEFA area of Assam the valleys are wilder and the mountain slopes more rugged and inaccessible.

The high mountains and plateaus extending westwards from the Indo-Burma border are marked by rapid changes in landscape within a short compass. A succession of forest-clad ranges and deep incised valleys occur in the Pātkai, Nāga and Mizo hills. The lovely lake in the Imphāl basin of Manipur and the magnificent pine forests and waterfalls of the Khāsi hills are among the other attractions of this region.

South of the Himālayas lies the great playground of the rivers of North India, extending from Punjab in the west to Assam in the east, across Uttar Pradesh, Bihār and West Bengal. The western part of it is an immense dust bowl; extensive, flat plains are dotted here and there with solitary trees, low sandy banks and broken ground. In the plains of Uttar Pradesh the river-banks, and especially the confluence of rivers, are impressive for their scenic beauty. Joined by the waters of the Son, Ghāghara and Gandak, the Ganga becomes full-bodied in Bihār; its confluence with the Gandak at Sonpur is a scene of grandeur. West Bengal has tidal estuaries fringed by the Sundarban forests, the natural habitat of Royal Bengal tigers. The landscape in Punjab is dominated by lower rainfall and advancing sands from the south. The Punjab plains merge southwards into the sandy, arid and semi-arid plains of Rājasthān with shifting sand-dunes, bare rocky hills, and interior drainage basins. Gujarat offers striking contrasts. Among them are the Girnār volcanic hills crowned with fine temples and the Gir forest, the only home of wild lions in India.

Farther south, vast rolling plains and rounded granitic hills characterize the uplands of the Deccan States: Mahārāshtra, Andhra Pradesh, Mysore and Madras. The plateau of Mahārāshtra affords opportunities for the study of a landscape evolved out of lava-flows on a gigantic scale, long before the birth of the Himālayas. A relic of ancient mountain topography is to be found in the so-called Eastern Ghāts of Andhra Pradesh. Mysore's Malnād topography is superb in natural scenery, and the Siva-samudram Falls of the Cauvery are unrivalled for romantic beauty. The plateau character gets lost towards the south because of extreme dissection of the landscape, and the country-side is interspersed with fine, isolated hills like those of Nagari and Nāgalā-puram.

A totally different type of landscape has evolved in the coastal plains. The backwaters of the Bombay harbour on the Konkan coast resemble the Bay of Naples in many respects, and on the same coast farther south the Ashtamudi lake has been likened to Loch Lomond. Long coastal dunes fringe the East Coast, both in Madras and Andhra Pradesh. Here, too, several lakes

such as the Chilka and Pulicat give variety to the coastal topography.

## 2. Major Landforms

All the major landforms—hills, mountains, plateaus and plains—are well represented in India. Here, no rigid line is drawn between hills and mountains; in popular parlance, even parts of the Himālayas are often referred to as hills and named after “hill-stations” like Simla or Darjeeling. Outside the Himālayas several other elevations with slight summit area and steep altitude of 2,000 to 3,000 m. or more could very well be designated as mountains, but they look small in comparison with the stupendous Himālayan heights and are therefore called hills. The Nāga hills with their highest summit Saramati (3,826 m.) in the east of Kohima are a typical example.

Hills and mountains  
India has seven principal mountain ranges: the Himālayas, the Pātkai and other ranges in the north-east, the Vindhya, the Sātpura, the Arāvalli, the Sahyādri (Western and Southern Ghāts), and the Eastern Ghāts. Each comprises an almost uninterrupted series of high elevations, though notched here and there by wind gaps and breached by river gorges.

The Himālayas, the highest mountain system of the world, contain most of the world's “eight-thousander” peaks. They are also the world's youngest and longest east-west mountain system, extending almost uninterruptedly for a distance of 2,500 km. and covering about 500,000 sq. km. Like the other tectonic mountains of the world, the Himālayas rose from the bed of an ancient sea. They were uplifted from the floor of the great Tethys, about 50 to 60 million years ago, the process starting in post-Nummulitic times and continuing till the Pleistocene. The Himālayas took six or seven million years to attain their full height while erosion continued to lower the surface. This slow rise accounts for the utter disregard of several Himālayan rivers to the present trends of the mountain ranges. For example, the west-flowing Sutlej has cut across a 6,000-m. high north-south range near Kalpa (Chini) and runs through a steep-sided valley, the thalweg of which touches the 1,500-m. level. It was after a substantial uplift of the Himālayas that the monsoon type of climate could be established in India. On a physical map the Himālayas appear as a gigantic crescent with the convex side

towards the North Indian plains. The southern boundary is well-defined by the 300-m. contour line in the west and 150-m. contour line in the east. From the foot-hills the Himālayas rise rapidly northwards to over 8,000 m. within a short distance of 150 km. and contain vast snow-fields (*himāl*) which feed valley glaciers and mountain torrents. These snow-fields attracted the attention of ancient India's geographers and they gave the name Himālaya to this great mountain system (*hima*, snow, and *ālaya*, home). The greater part of the Himālayas, however, lies below the snow-line and owes its ruggedness mainly to fluvial erosion.

The Pātkai and other associated mountain ranges run to the south of the Assam Himālaya along the Indo-Burma border and have an arcuate trend, the convex side pointing towards India. They are known under different names in different parts of the NEFA, Nāgāland, Manipur, and the Mizo District of Assam, but collectively they can be grouped under the name Pūrvāchal (*pūrva*, east, and *achal*, mountain). The same orogenic movement that uplifted the Himālayas is also responsible for the rise of the north-eastern mountain arc.

India has not only the highest mountain of the world, but also its oldest. This is the Arāvalli, which occupies the site of an ancient geosyncline and was uplifted and folded in synclinorium for the first time during the Algonkian age, 600 to 700 million years ago. The present Arāvalli has lost its range character in many parts and is now a relic of what it was in the past when it formed India's main watershed, extending from the Kumaun Himālaya to the farthest end of the Peninsular plateaus on the south, and perhaps one of its arms reaching eastwards across Central India. In that remote age several of its summits rose above the snow-line and nourished glaciers of stupendous magnitude, which in their turn fed many rivers. The Arāvalli range was later reduced by long, continuous erosion almost to sea level. There is evidence to suggest that in the late Mesozoic times, perhaps about 100 million years ago, the peneplaned Arāvalli was uplifted for the second time by at least 1,200 m. near Udaipur city, and 300 m. at its two ends near Delhi and Ahmadābād. With the progress of the newer cycle of erosion subsequent to the second uplift, the strong quartzites stood up as bold ridges, and valleys locally known as "chinds" were carved out of softer phyllites, thus exhibiting a structure typical of the Appalachians.

The weathered products of the ancient Arāvalli range were ultimately deposited in the Vindhyan sea to form later the

Vindhya range and plateau. The Vindhya range traverses nearly the whole width of Peninsular India, a distance of about 1,050 km. with an average elevation of 300 m. above sea level, The Vindhya range overlooking the valleys of the Narmada and the Son on the south and sloping gently northwards to the Ganga valley. Forming one of India's main watersheds, this mountain was long recognized along with the Sātpura range as the dividing line between North India and the Deccan. Its distinctive features are due mainly to the northward tilting of the Mālwa and Vindhyan plateaus, and the subsequent erosion of their southern plateau edge. Topographical evidence such as truncated and faceted spurs suggests that at least a part of the Vindhya range, especially in the west, is a fault escarpment. There is, however, no clear geological evidence to support this view.

South of the Vindhya and more or less parallel to it rises another ancient mountain system of India, the Sātpura. It extends from Ratanpur on the west to Amarkantak on the The Sātpura range east, a distance of 900 km. No other east-west tectonic mountain of Peninsular India is as high as the Sātpura. Several of its summits rise above 1,000 m. and only a small part of this mountain system lies below the 500-m. contour line. In shape it is triangular, with its base along the north-south Maikala range, its apex at Ratanpur, and two of its sides parallel to the Narmada and Tāpti-Pūrṇa rivers. The total mountain area is 75,000 sq. km. As its name indicates, the Sātpura (*Sāt*, seven, and *pura*, fold) consists of a number of parallel ranges, known under different names in different parts and enclosing in between them extensive, flat-topped, lava plateaus.

The Sahyādri, with an average height of 1,200 m. runs for about 1,600 km. along the western border of the Deccan from near the Tāpti (Tāpi) mouth in the north to Cape Comorin, the southernmost point of India, overlooking the Arabian Sea on the west and running more or less parallel to the coast. It is also called The Sahyādri (the Western and Southern Ghāts) the Western Ghāts as far as the Nilgiri, and south of the Pālghāt Gap it is known as the South Sahyādri. Viewed from the West Coast, the Sahyādri looks like an ancient sea-cliff, rising almost perpendicularly from the coastal plain up to 1,000 m. in some places. It may also be a fault scarp, the western part of which has either drifted away further westwards or has subsided and now forms the sea-floor. This accounts for the fact that all the important rivers of Peninsular India except the Narmada and the Tāpti flow eastwards into the Bay of Bengal, though they have their sources on the crest of the Sahyādri, which is only 50 to 80

km. from the Arabian Sea coast. The heights of the Sahyādri catch the full force of the moisture-laden monsoon winds; consequently, heavy rains are precipitated on the western scarp face and coastal plains, and the inland plateaus bordering the Sahyādri on the east are deprived of rain.

The Peninsular plateaus are bordered on the east by the Eastern Ghāts, a tectonic range cut by powerful rivers into discontinuous blocks of mountains. The Eastern Ghāts become a prominent mountain range with summits above 1,000 m. in their northern part between the Godāvari and the Mahānadi, and their strike from north-east to south-west is in the same direction as that of the Arāvalli. South of the Krishna occurs a more well-defined part of the Eastern Ghāts; this is the Nallamala hills, a series of parallel ranges and valleys. North of the Godāvari, the Eastern Ghāts are locally known as the Mahendragiri.

Much of the surface of India has developed a plateau character. Extensive plains, either flat or rolling, at levels ranging from 300 to 900 m. and bordered by scarps, are the main features of plateau landscape. This surface may be dotted with conical or rounded hills or traversed by flat-topped ridges. Mālwa and Vindhya plateaus of Central India abut against the Vindhya range on the south and slope gently northwards. One is composed of horizontal lava-flows and the other stands on horizontal or gently dipping strong sandstones of the Vindhya system and is heavily scarped. Both these plateaus are drained mainly into the Yamuna and the Ganga by north-flowing rivers of which the Chambal, Betwa and Ken are important. The Son river separates the Vindhya plateau from its southern neighbour, the Baghelkhand plateau. The latter is formed partly of granites and partly of sedimentaries of the Gondwāna system, and is bordered on the north by the Sonpār hills. Farther east lies the Rānchi, Hazāribāgh and Kodarma plateaus, built mainly of granitic gneiss. Collectively known as the Chota Nāgpur plateau, these occupy a well-defined north-eastern part of the ancient stable land-mass of Peninsular India.

South of the Narmada river the Sātpura contains a number of high plateaus. Two of these deserve special mention: the Betūl plateau, the central lava plateau in the Sātpura, rising to 1,200 m. with a rolling grassy surface; and the Maikala plateau, bordered on the east by the Maikala range and varying in altitude from 450 to 900 m. South of the Tāpti-Pūrna and west of the Wain-ganga-Prānhita-Godāvari stands the largest and most pronounced plateau of India, the Deccan. It covers 700,000 sq. km. and slopes

eastwards and northwards. The 300-m. contour line may be taken as its northern and eastern boundary. The Deccan plateau abuts against the Sahyādri on the west where numerous flat-topped spurs give diversity to the topography and form watersheds between the east-flowing rivers. On the basis of details in topographical features, the Deccan plateau may be subdivided into three broad sections : Mahārāshtra, Karnātaka and Telangāna. The greater part of the Mahārāshtra plateau is formed of lava and cut diagonally by the Godāvari, Bhīma and other rivers into blocks of highland and lowland. Except at a narrow fringe on the north, the Karnātaka plateau is formed essentially of Dhārwārian schists and granites and gneisses of the Archaean age. The topography is one of rounded hills and rolling plains. Almost the same type of topography prevails in the Telangāna plateau, though its general elevation is much less, 150 to 600 m. All over, there are bare granite hills and shallow depressions flanked by low scarps. A totally different type of plateau is to be seen in Kashmir. This is the Ladākh, over 4,000-m. high, dry and dreary, and marked by frost-shattered rocks and sharp angular peaks.

The plains of India are the most important type of landform from the standpoint of human use. They cover more than a million sq. km. and are extensively cultivated and densely populated wherever water is available.

**Plains** Almost all types of plains are represented. The alluvial plains are most extensive in North India, covering the greater parts of West Bengal, Bihār, Uttar Pradesh and Punjab, and also occurring in Assam and Rājasthān. Abandoned river-courses, typical ox-bow lakes and long stretches of marshy land behind river-banks characterize this type of plain. Nowhere do the alluvial plains rise much above 300 m. They are almost at the base level of erosion in the Sundarbans of West Bengal, traversed by a network of meandering estuaries and anastomosing channels. Alluvial plains stretch in the East Coast from Cape Comorin to the Mahānadi delta, across three other deltas, built by the Cauvery, Krishna and Godāvari.

Most of the rivers in the Himālayas have built up plains in high altitudes and subsequently dissected them into terraces. The Indus in Kashmīr, the Sutlej in the Punjab Himālaya, and the Ganga in the Kumaun Himālaya enter into such terraced plains at a number of places. Small alluvial cones have also been built up by tributary streams in the Himālayan region. South of Leh, the Indus has on its banks a number of such alluvial cones, each marking the site of a village. The lacustrine and glacial plains in the Himālayas and other mountains are the other types of mountain

plains. The vale of Kashmīr, the Imphāl basin in the Manipur hills and the Nawng Yang basin of the Pātkai range are typical examples of ancient lakes subsequently filled up and uplifted to their present position. The Ladākh plains to the east of the Shyok river and north of the Chāng Chenmo river are examples of glacial plains, which occur also in Deosai to the south of Skārdū and in Taroan, Mishmi hills. The Baspa valley owes its present form to glacial action.

The plains at the foot of the Himālayas are a good example of piedmont plains. They are known as *bhābar* in Punjab and *duār* in Assam. The *bhābar* plains have been dissected into terraces by the *cos* which remain dry for the greater part of the year. West of the Arāvalli, there are rocky arid plains of the *hamada* type, especially near Jaisalmer town. Lava plains occur on the Konkan coast. Pediplains, resulting from the recession of hills, are widespread in South India. Coastal plains of the emergent type with lagoons and backwaters are seen on both the coasts. Plains formed in earlier geological ages and subsequently uplifted are found on many hill-tops. Such peneplains crown the summits of the Nīlgiri and Shillong hills.

### *3. Agents of Erosion and Changing Landscapes*

Landforms are not static. They are continually changing and running their life-cycles. Glaciers at high altitudes in the Himālayas are active agents of erosion. Flowing surface water is, however, the most important natural agent responsible for this change in the Indian landscape. Underground water, which comes out as springs or artesian water in hilly areas, or is pumped out from dug-wells and deep tube-wells in the plains, also has its function. Wind is very effective in the Western Rājasthān desert and along the East Coast in removing sand from one place to another and in defacing solid rocks.

In a tropical country like India, glaciers can originate only at the high altitudes of the Himālayas. Snow is precipitated more on peaks and the higher slopes than in valleys and passes, and accumulates on the ground above a certain height called the snow-line. This line varies between 4,500 and 6,000 m. in the Western Himālayas, and between 4,000 and 5,800 m. in the Eastern Himālayas, the snow-fall in Nepāl and Sikkim being heavier. When an appreciable mass of snow accumulates, it starts to move downwards and becomes a glacier

or moving ice. Outside the polar regions India has the largest area under snows and glaciers, and the world's largest mountain glaciers are to be found in the Himālayas. The snow-fields, called *himāl*, cover about 40,000 sq. km. from Kashmīr in the west to Assam in the east. The two highest ranges of the Himālayan system, the Great Himālaya and the Karakoram Himālaya, have a galaxy of large ice-streams which have no parallel in any other mountain system of the world. These glaciers provide approach routes to the Himālayan peaks, Mt. Everest, Kānchenjunga, Nanda Devi, K<sup>2</sup> and others. Snows and glaciers are nature's gift to the people of India. They not only feed the great rivers like the Ganga, Yamuna and Gandak, but influence monsoon rainfall in the plains and fresh snow-fall in the mountains. Four of India's largest glaciers, Siachen (70 km.), Baltoro (60 km.), Biafo (60 km.) and Hispar (62 km.) occur in the Karakoram Himālaya and cover an area of nearly 13,000 sq. km. These feed the Nubra and Shyok rivers and other right-bank tributaries of the Indus. The majority of the glaciers, however, are about 6-km. long. Several glaciers occur in the Kumaun Himālaya of Uttar Pradesh—the largest, Gangotri, is 30-km. long and 3-km. broad. The Mahālangur Himāl with its Khumbu glacier drains the Everest region in Nepāl. Farther east lies the Kānchenjunga Himāl, partly in Nepāl and partly in Sikkim. Some of the other larger Himālayan glaciers in this region are Zemu, Yalung, Talung, Jano and Kānchenjunga.

The rate of movement of Himālayan glaciers varies considerably; some, like the Baltoro in the Karakoram Himālaya, move almost 2 m. per day, while others like the Khumbu in the Nepāl Himālaya move only 13 cm. in a 24-hour period. Most of the Himālayan glaciers are also found to retreat. Glaciers of the Badrīnāth region had descended almost down to Badrīnāth and the Gangotri temples; they have retreated of late.

The total available volume of flow from India's rivers is assessed at 1,683,000 million cubic metres per year. So much water is bound to deepen the beds over which it flows and widen the channels, effecting considerable destruction of the landscape. The flowing waters also do a great deal of constructive work. They build alluvial terraces in the Himālayas, piedmont plains at the foot of the hills and mountains, flood plains in their courses throughout, and deltas at their mouths. The Great Plains of North India are the creation of the eastern tributaries of the Indus, the Ganga and its affluents, and the Brahmaputra. The East Coast deltas are the handiwork of the Mahānadi, Godāvari, Krishna and Cauvery rivers. The direction of flow of the rivers is normally determined by the trends of

high mountain ranges. Generally speaking, there are in India three principal watersheds. The Great Himalaya along with its Karakoram branch forms a watershed in the north, though several Himalayan streams do not seem to have been controlled by this line; the Vindhya range in Central India, strengthened by the Sātpura-Maikala forms the second principal watershed. The Sahyādri is the third watershed which directs the courses of most of the Deccan rivers including the Godāvari, Krishna and Cauvery.

Rivers in India are of four major types: Himalayan; rivers of Central India and the Deccan; coastal rivers; and rivers flowing into interior drainage basins. The Himalayan rivers are generally snow-fed and continue to flow throughout the year. In their mountain courses they pass through deep gorges, V-shaped in form because of excessive vertical cutting. The rivers of Central India and the Deccan are generally rain-fed and their volume of water fluctuates considerably throughout the year. Coastal streams, especially in the west, have limited catchment-areas. Most of the streams of the interior drainage basins are of an ephemeral character. They drain towards the individual playa basins or salt lakes like the Sāmbhar, or are completely lost in the sands and have no outlet to the sea. The Lūni is the only river that drains an area of about 37,250 sq. km. into the Rann of Kutch.

The drainage basins of India vary in size to a great extent. The Ganga basin, the largest, receives waters from an area of about 838,200 sq. km.—about a quarter of India's total area. The second largest is the basin of the Godāvari. It covers an area of about 323,800 sq. km. or about, 10% of the total area of India. The basins of the Brahmaputra in the east and that of the Indus within Indian territory are nearly equal in area—285,000 sq. km. and 285,300 sq. km. respectively. The Krishna basin is the second largest in Peninsular India, with an area of about 271,300 sq. km. The Mahānadi in Orissa flows through the third largest basin in the Peninsula—192,200 sq. km. The basins of the Narmada (94,500 sq. km.) in the north and the Cauvery (94,400 sq. km.) in the south are about the same size, though of different character and shape; the Narmada flows westwards while the Cauvery, like most of the rivers of South India, flows eastwards.

Except in the alluvial tracts, the underlying structure of the greater part of India is not favourable for storing up a substantial part of the rains precipitated during the monsoon months. Even so, there are pockets of aquifers scattered all over India at different depths. Properly tapped, these might yield enough water for domestic and

agricultural purposes. There are at least three major ground-water basins in India; the Ganga basin; the Punjab alluvial basin stretching from Ludhiāna to Amritsar ; the western basin, covering that portion of Rājasthān which lies north of  $28^{\circ}$  parallel, and curving southwards towards the Gujurāt plains as far as Ahmadābād. The flow of ground-water in these basins is not substantial because of the flat terrain. Of these three, the Ganga basin is the largest. There are more than 5,000 deep tube-wells in Uttar Pradesh drawing water from underground with the help of power-driven pumps; the majority of these are located in Western Uttar Pradesh. The deep tube-wells in the Greater Calcutta region also yield a large volume of water. One well yields as much as 82,000 litres per hour, while the average is 27,000 litres.

The porous sandstones of the Himālayan foot-hills with their synclinal structure provide ideal conditions for artesian water, and hence within this belt there is considerable scope for establishing a large number of flowing wells. The artesian conditions are also fulfilled along the edge of the Narmada valley to the north of the Sātpura range where water-bearing conglomerate beds are overlain by low ridges of impervious crystalline rocks. In Gujurāt, an artesian zone also occurs at a great depth, 270-370 m. below ground level, the maximum recorded yield of water in a well at Viramgām being 114,000 litres per hour. The Mahārāshtra lava plateau contains ground-water in cracks and fissures in the neighbourhood of rivers and streams; more so, in the weathered portions of the trap rock which get saturated with water and retain it wherever it is circumscribed by fresh trap. Laterites and inter-trappean beds also serve as good aquifers in the trappean country.

Like the surface streams, ground-water also flows, especially in hilly areas where the rocks are pervious. Such underground streams flowing through limestone are found near Caves Cherrapunji in the Khāsi hills, Assam and near Dehra Dūn, Uttar Pradesh. Their main work is to widen the subterranean channels through which they pass, giving rise to a system of caves with characteristic deposits like stalactites and stalagmites, one formed of dripping water particles from the roof, and the other growing up as a pillar from the ground. Sink holes and short blind valleys are also common along the southern fringe of the Meghālaya where the rock is limestone. A good example of natural caves carved out of sandstones is found in the Rāmgarh hill, Madhya Pradesh.

The ground-water ultimately reappears on the surface in the form of springs and gives rise to streams. There are several such

springs in India, found mainly in three regions; the Kumaun Himālaya in Uttar Pradesh; the low gneissic hills and uplands of South Bihār; and the western foot of the Sahyādri Springs in the Konkan region. The majority of these are cold springs, but a few are hot springs with or without sulphur. A typical example is the group of hot sulphur springs on the bed and banks of the Sutlej at Tattapāni near Simla. In the Kumaun Himālaya most of the hot springs occur on the Great Himālaya around the Kāmet and Nanda Devi group of peaks. One celebrated spring, Sahasradhāra in the Rājpur area of Dehra Dūn, contains sulphur, though its water is cold. In Bihār, the thermal springs of the Monghyr District occur in a line extending over a distance of 50 km. along the strike of the Kharagpur hills in what appears to be a zone of faulting in the Archaean rocks. There are more than a dozen hot springs in Rājgīr. The four hot sulphur springs of Mānbhūm and the two in Hazāribāgh also deserve mention. Bakreswar in the Birbhūm District, West Bengal, has a hot sulphur spring, the temperature of which ranges between 53°C and 72°C, and the volume of water ejected from the hottest well is nearly 340 litres per second. Cold springs in Mussoorie and Landour yield a large volume of water. The Vajreswari mineral springs along the Tānsa river in the Thāna District are a good example of Konkan springs. There are a number of springs in the Ratnāgiri District. Farther west, on the western slope of the Sahyādri, the hot spring at Sangameshwar is noteworthy.

For a country of its size India has only a small number of lakes. There are a few in the Himālayas; most of them are basins scooped out by glaciers or dammed by moraines and subsequently filled up with water. The Sisharam Lakes Nāg on the route to Amarnāth from Pahlgām is a typical example. The smaller valleys radiating from Kolāhoi peak (5,425 m.) also have a string of such lakes—Har Nāg and Dudh Nāg are the largest. The Wular, 100 sq. km. in area, is the largest lake in the Kashmir valley, controlling the flow of the Jhelum and other rivers. It appears to be a structural depression, unlike the smaller lakes of the valley, the Anchār and Dal. In the Kumaun Himālaya, the Bhīm Tāl is the largest in a series of lakes near Naini Tāl town. These lie along a line and appear to have been formed by faulting. Several scattered lakes are to be seen in the higher altitudes; some of them owe their existence to landslides. The Chandra Tāl at a height of 4,420 m. near the head of the Spiti valley appears to be of this type. Among the lakes near the northern border of Sikkim, Gurudongmar Cho is important.

Temporary lakes originate in the Himālayas whenever a valley is dammed by a rock-fall or ice-fall. The Gohnā lake, an example of this type, was formed at the end of the last century by a rock-fall across the Alaknanda river and then disappeared within a year on the removal of the barrier. The Shyok valley in Kashmīr is often obstructed by the advance of a tributary glacier, and temporary lakes are created. The lakes of Ladākh and Rupshu: Salt Lake, Pangong Lake and Tso Morari are continually shrinking and becoming more and more saline.

Western Rājasthān has a number of playa lakes, that is, interior basins with centripetal drainage. Of these, the Sāmbhar salt lake is by far the most important. A number of long lakes between sand-dunes of the sief type in Western Rājasthān are known as *dhangs*. The only lake of volcanic origin is located in the Deccan, within one kilometre of Lonār town in the Buldāna District. The Lonār lake is circular in outline, with a diameter of 700 m. There is evidence to suggest that it is a crater lake.

#### *4. Physiographic Divisions and their Salient Features*

A systematic study of the physiography of India can be attempted only on a regional basis. It is true that in India the three major landforms—mountains, plateaus and plains—occupy distinct tracts of the country; but within a larger frame, there are many deviations from the norm. For example, within the Himālayas there is the vale of Kashmīr, which has a plains topography. The Rājmahāl hills come down almost to the Ganga river in the Great Plains of North India. There are many hills diversifying the otherwise flat topography of the Deccan plateau. A synthetic approach is, therefore, necessary in the scientific study of the smaller landform units, which will ultimately lead to their integration into macrophysiographical regions. According to this principle, India has seven major physiographic divisions : Northern Mountains which include the Himālayas and the mountain ranges in the north-east ; Great Plains; Central Highlands ; Peninsular Plateaus ; East Coast ; West Coast ; and Bordering Seas and Islands. The topography of the Himālayas has no parallel in the world. The north-eastern mountains have Appalachian features. The Great Plains are one of the world's largest aggradational plains. The Central Highlands with their two border ranges and many scarps exemplify the influence of rocks on topography. The Peninsular Plateaus with their rolling topography form one of the

world's largest stable land-masses. India's coastal plains are mainly of the emergent type, featuring lagoons or backwaters. The islands are, in general, the summits of submarine mountains, or they are of coral origin.

### *Northern Mountains: The Himālayas*

High relief, snow-capped summits, deeply dissected topography, antecedent drainage, complex geological structure and rich temperate flora in subtropical latitudes give a very distinctive character to the well-defined mountains of India, the Himālayas. The ascent of the Eastern Himālaya from the plains is much more abrupt than that of the Western, and it receives four times as much rainfall. Hence, it is clothed with a richer and denser forest flora. The Kāli river limits the Western Himālaya in the east, whereas a high transverse range, the Singālila, marks the western limit of the Eastern Himālaya. Nepāl, a hundred per cent Himālayan country, occupies a central position between the Western and Eastern Himālaya. The Western Himālaya is further subdivided into four regions: the North Kashmir Himālaya, South Kashmir Himālaya, Punjab Himālaya and Kumaun Himālaya, from west to east. The western part of the Eastern Himālaya includes the Sikkim Himālaya, Darjeeling Himālaya and Bhutān Himālaya. The Assam Himālaya embraces the remaining portion of the Eastern Himālaya. The unity of the Himālayan mountains, 2,500-km. long and 150 to 400-km. broad, is centred mainly on their east-west trend. Another unity lies in the fact that, in general, three sections have developed from south to north: the Siwālik (Outer Himālaya) in the south, the Himāchal (Lesser Himālaya) in the middle and the Himādri (Great Himālaya) in the north.

This range represents the outermost foot-hills of the Himālaya with a hogback structure. Formed of river-borne deposits from the rising Himālaya farther north, it is subsequently indurated, folded and faulted by earth movements, marking the latest phase of the Himālayan uplift, from the Middle Miocene to the Lower Pleistocene age. Fault scarps, anticlinal crests and synclinal hills with an average elevation of 600 m. characterize the Siwālik range. It is bordered invariably at the top by scarps and descends northwards to flat-floored structural valleys called *dūns*, which are intensively cultivated and densely populated. The inner portion of the

The Siwālik  
frontal range

Siwālik comprises a series of parallel ridges and structural valleys, rising to a maximum height of about 1,500 m.

The Siwālik range abuts against a more massive mountainous tract, 75-km. wide, where mountains and valleys run in all directions, the former rising to 5,000 m. and the latter touching 1,000 m. There is a general accordance of altitude among neighbouring summits, giving this mountain belt the appearance of a highly dissected plateau. Locally linear longitudinal ranges have also developed; with steep, bare southern slopes and more gentle, forest-covered northern slopes, they give these ranges a typical hogback look, more pronounced here than in the Siwālik. The ranges are mainly composed of highly compressed and altered rocks, varying in age from the Algonkian to Eocene. In the geological literature this mountain belt is often referred to as the Lesser Himālaya, but in view of the fact that many of its peaks rise to 5,000 m. and contain patches of snow throughout the year, the ancient name of this region, Himāchal, is preferable. A newly constituted State within this region has been named Himāchal Pradesh.

At its northern end the Himāchal section ends abruptly and the most majestic range of the Himālaya comes into view. Great Himālaya is a recent name; the ancient name was Himādri (the Great Himālaya). The snowy peaks and ridges owe the details of their forms to glaciation. This great mountain arc terminates abruptly both at its western and eastern ends, conforming to the syntactical bend of the underlying rocks. It is an asymmetrical mountain, throwing very few spurs southwards. Its northern slope descends gradually to some important river valleys running parallel for long distances. The Himādri has a core of granite, flanked by metamorphosed sedimentaries.

The broadest part of the Himālayas lies in Kashmīr. It is 700 km. from west to east and 500 km. from north to south, covering 350,000 sq. km. of mountainous tract.

**The Kashmir Himālaya** There are great contrasts in relief features, forest cover, soils, climate and accessibility. Of all the Himāyan regions, Kashmīr has the largest share of snows and glaciers and there is evidence to suggest that glaciers had covered a much larger area in the past, descending to Pahlgām in the vale of Kashmīr. No other part of the Himālayas is traversed by so many high ranges running diagonally and flanking trough-like, longitudinal basins. The Great Himālaya range may be taken as the dividing line between the North Kashmīr and South Kashmīr Himālayas.

The Kashmīr Siwālik is represented in the Jammu hills which extend from the river Jhelum to the Rāvi. Jammu town stands on a Siwālik hill, overlooking the Tawi river. These hills are very much dissected, and synclinal valleys often form ridge crests. They are fringed in the south by a belt of stony arid surface called *kandi*, which does not have enough surface water for irrigation. Behind the Jammu hills rise the Pūnch hills, to a maximum height of 3,000 m. and are composed of sandstones and shales of earlier age. The trend of these hills corresponds to the strike of the rocks.

North of the Jammu hills there are the typical ranges of the Himāchal section (the Lesser Himālaya) in Kashmīr. The average width of this belt is 100 km. and the average height, 3,000 m. This Himālayan strip is characterized by its ruggedness and pronounced relief. At its lowest level, 440 m. is the Jhelum gorge near Muzaffarābād. The highest point, 4,743 m. is the Tatakūti peak of the Pīr Panjāl, 50 km. south-west of Srinagar. Most of the linear ranges in this section of Kashmir are of a longitudinal type, either bifurcating from the Great Himālayan range (Himādri), or running oblique to it. There are several transverse ranges as well. The Pīr Panjāl is an example of the former type. An abrupt rise to over 4,000 m. from the 1,200-m. level of the southern hills, a hogback structure with a steep and bare southern dip slope, and jagged snow-covered summits, make this mountain range very conspicuous even from the plains of Punjab. It takes off from the Great Himālayan range about 100 km. south-west of Nanga Parbat and runs for 400 km. eastwards, first swerving round the western rim of the vale of Kashmir and then forming the watershed between the Chenāb and the Rāvi. The Pīr Panjāl range owes its origin to thrust faulting and isoclinal folding, and is transversed by two well known passes, the Pīr Panjāl (3,494 m.) and Banihāl (2,832 m.), the latter now providing the main gateway to the vale of Kashmīr from the plains of India. It is also breached by three Himālayan rivers, the Kishanganga, Jhelum and Chenāb. The average height of the Pīr Panjāl range is 4,000 m.; some of its peaks rise higher, especially near its eastern end in Lāhul, where snows accumulate and glaciers are born.

The most picturesque and densely populated part of the Kashmīr Himālaya lies in the structural basin, a synclinal valley, once the bed of a great lake. The ancient lake was filled up and subsequently uplifted, developing its present structure. The valley is enclosed by a ring of mountains, the Pīr Panjāl in the south and a northerly branch

The Vale of  
Kashmīr

of the Great Himālaya in the north. It extends from south-east to north-west for a distance of 150 km. with an average elevation of 1,700 m. and a width of 80 km. and is traversed by the north-flowing Jhelum. This river rises at the southern end of the valley from a deep spring at Vernāg, meanders for 130 km. north-westwards as far as the Wular lake, and then flows westwards, emerging from the lake near Sopor and entering a gorge across the Pīr Panjāl range. After its confluence with the Kishanganga the Jhelum turns sharply to the south near Muzaffarābād, flows in that direction for 100 km. till it is joined by the Pūnch river, and then leaves the Indian border. The river receives two important tributaries on its right bank, the Sind and the Liddār, the latter showing evidence of past glaciation, especially in the Pahlgām area. The Jhelum is navigable from Anantnāg to the gorge at Bāramūla. Fringing its bank lies a flat plain dissected into terraces and developed on older lacustrine deposits called *karewas*—it reaches a height of 3,500 m. in a tilted position. Some of these *karewa* terraces, dry and treeless, depend on rain-water for their cultivation; others are irrigated by mountain streams and produce crops of rice, maize and saffron. There are several beauty spots in the valley. Gulmarg is one. A grassy valley rich in flowers, it lies at the northern slope of the Pīr Panjāl range. From Gulmarg, on clear days, a fine view of Nanga Parbat can be obtained. Srinagar, the capital of Kashmīr, is in the heart of the valley, 1,893 m. above sea level, astride the Jhelum river which is spanned by seven bridges. The picturesque Dal lake near Srinagar appears to have been carved out of the alluvial deposits of the Jhelum.

The crest of the Great Himālaya in Kashmīr starts from Nanga Parbat (8,126 m.), which dominates the topography for 100 km.

on all sides. Like most Himālayan peaks, Nanga

The Kashmir Himādri (the Great Himālaya) Parbat has a core of granite with altered sedimentaries of the Algonkian age on its top and flanks. From

Nanga Parbat the crest runs zigzag eastwards for 850 km. at an average elevation of 5,500 m. flanked by a number of basins. The Deosai basin with its even floor and steep sides seems to be an ancient cirque carved out by former glaciers. The ruggedness of the terrain of the Kashmīr Himādri is reflected in the sparse population, the river valleys being the only sites where settlements could exist. The absence of roads is another indication of the extreme ruggedness of the topography. The only road to Leh, capital of Ladākh, passes over the Zoji La (3,529 m.), an important pass traversing the Great Himālaya.

The Indus traverses Kashmīr diagonally for a distance of 650 km. remaining confined within a narrow trough, 10-km. wide.

on an average. Rising from the springs of Sengge Khabab, about 100 km. north of Mānasarovar, this great river flows north-west for the first 250 km. in a great curve through Tibet before entering Kashmīr, south-east of Demchok. It continues to flow north-west for 560 km. in an asymmetrical valley as far as the base of Haramosh peak (7,397 m.), cutting the Ladākh range twice at Thangra and Khartaksho, 160 km. south and north of Leh respectively. The asymmetrical nature of the valley of the Indus from Demchok to Skārdū is due to the fact that the river is bordered by granitic rocks on its right bank and Tertiary sandstones and shales on its left. Leaving Haramosh on its right, the Indus takes a sharp southerly turn, cutting the Ladākh range for the third time through a terrific gorge, 5,200-m. deep near Bunji. Flowing for another 90 km. westwards past Nanga Parbat, the river leaves Kashmīr for Pākistān. Three important rivers join the Indus on its left bank—the Zāskār, Drās and Astor, fed by glaciers of the Great Himālaya; and two on its right bank—the Shyok near Khapalu and the Shigar at Skārdū, both fed by melt-waters of the Karakoram glaciers. From the confluence of the Indus with the Shigar at Skārdū, sandy semi-arid plains extend up the Shigar for 50 km. The Indus flows for 30 km. above and below this confluence through the same type of steppe country.

North of the Indus lies the Great Karakoram, known in Sanskrit literature as Krishnagiri. It is a region of lofty peaks and vast glaciers. Many of the Karakoram glaciers feed the Nubra river, which has a number of such streams and at least 12 medial moraines. The Rimo glacier is a type by itself. It feeds at the same time the north-flowing Yarkand river and the south-flowing Shyok. Steppe-like and semi-desert landscape characterizes the Karakoram Himālaya except in the irrigated valleys, where one can see smiling verdant oases with fruit orchards. One such oasis is Askole in the Braldu valley, the highest inhabited settlement in the Karakoram. The second highest peak in the Himālayas, K<sup>2</sup>, rises abruptly from the end of the Baltoro glacier in Western Karakoram. Overlooking the Baltoro glacier, 60-km. long, rise magnificent peaks from 5,500 to 7,000 m. and four of the world's fourteen "eight-thousanders"—K<sup>2</sup> (8,611 m.), Hidden Peak (8,068 m.), Broad Peak (8,047 m.), and Gasherbrum II (8,035 m.). Rakaposhi (7,788 m.) and Haramosh (7,397 m.) peaks are also impressive. The Karakoram valleys are very hot in summer, but the nights are bitterly cold, particularly in winter. This

accounts for the prevalence of shattered rocks in the valleys of the Braldu and Basha, tributaries of the Shigar. All the valleys are flat-floored and provide excellent sites for human settlement.

The Ladākh plateau with an average elevation of 5,300 m. occupies the north-eastern portion of the Kashmir Himālaya, abutting against the Krishnagiri and the Pangong ranges on the west. It is the highest plateau of India, containing remnants of at least three peneplains at heights ranging between 5,300 and 5,800 m. One of India's most inaccessible parts, high and dry, it has all the landforms of a steppe country. The Chāng Chenmo range divides Ladākh into two distinct parts. North of this range, the Chāng Chenmo river flows westwards in an asymmetrical, flat-floored valley. There are a number of hot springs. On the higher slopes mountain lakes like the Ororotse Tso add to the natural beauty of the region. Farther north occurs a typical interior drainage basin, carved out of limestones and shales of the Mesozoic age, containing a number of salt lakes with centripetal drainage. The plateau has been dissected into plains and mountains. From south to north, they are designated Lingzi Tāng plains, Lokzhung mountain, Aksai Chin and Soda plains. The plains of this part of Ladākh plateau show ample evidence of past glacial action and are absolutely dry and bare—even nomads do not dare move about for want of pasture.

The portion of the Himālayas that lies in Himāchal Pradesh and Punjab is known as the Punjab Himālaya. It covers 45,000 sq. km. All the three sections of the Himālayas are well represented here. Except the Indus and the Jhelum, all the other rivers that have made the plains of Punjab agriculturally productive rise from this part of the Himālaya. Both the headwaters of the Chenāb, Chandra and Bhāga, rise in Lāhul near the two ends of the pass over the Great Himālayan range, the Bāra Lācha La (4,891 m.). The rivers unite and then the Chandrabhāga flows through Punjab and Himāchal Pradesh for about 100 km. along a structural trough parallel to the Pīr Panjāl range. Entering Kashmīr, it becomes known as the Chenāb. With a sharp turn southwards it cuts through the Pīr Panjāl near Kishtwār in a deep gorge, receiving all along its course tributaries with overhanging valleys. The length of its course in Kashmīr is about 250 km. There is a concentration of settlements all through its passage from Punjab to Kashmīr. South of the Chandra rises another river of Punjab, the Rāvi, from an amphitheatre-like basin called Bangāhal, the greater part of

which lies in Himāchal Pradesh. It first flows westwards through a trough separating the Pīr Panjāl from the Dhaola Dhār range, and then turns southwards, cutting the latter through a deep gorge. Before entering the plains near Shāhpur the Rāvi again cuts through the Siwālik range. Its length from its source to its exit from the Himālaya is about 200 km. The Rāvi then flows through the plains of Punjab. The two other Punjab rivers that have their sources or upper reaches in the Punjab Himālaya are the Beās and the Sutlej. The former rises from near the Rohtāng pass (3,978 m.) in the Pīr Panjāl range and unlike other Punjab rivers it flows southwards for 70 km. before turning westwards and entering a precipitous gorge at Lārji. Flowing in the same direction for another 125 km. it comes out of the Siwālik range near Talwāra.

Of the five Punjab rivers, the Sutlej is the largest and it is the only one that has its source beyond the Indian frontier. Rising from near the Darma Pass on Zāskār range, it joins another branch (Langchhen Khabab) coming from the east through the Mānasarowar and Rakas lake. It then flows through the Ngari Khorsum plateau of Tibet for about 250 km. the last 50 km. of this course being a veritable canyon. The river soon enters India and flows south-west, cutting through the Great Himalaya range in a deep gorge, the difference in height between the floor of the valley and the adjoining mountain peaks being 5,000 m. From the Shipki pass to Rūpar, where the river comes down to the plains, the length of the Sutlej is 300 km.

The Pīr Panjāl range of Kashmīr enters Himāchal Pradesh a little north of the headwaters of the Rāvi and runs eastwards for 120 km. forming the watershed between the Chenāb on the north and the Rāvi and Beās rivers on the south. The highest summits rise to over 5,000 m. and remain snow-covered. South of the Rāvi runs the snowy Dhaola Dhār range towards the Beās valley in an arcuate form, its convex side facing the Kāngra valley. Its highest peak is a little over 5,000 m. The Kāngra valley, noted for its scenic beauty, extends from the foot of the Dhaola Dhār range to a little south of the Beās river along the northern edge of the Hamīrpur plateau. Its importance today lies in its potential mineral oil wealth. The upper Beās is known as the Kulu valley. It is connected by the Rohtāng pass with Lāhul and the Spiti valley, two other important physiographic subsections of the Punjab Himālaya. From Manāli in the Kulu valley, the two highest mountains of Kulu, Deo Tibba (6,001 m.) and Indrāsan (6,220 m.), can be easily approached. The

Chandra valley in Lāhul is uninhabited except for the visit of nomadic shepherds in summer.

The most frequented portion of the Himālayas lies in the Kumaun region, administratively forming a part of Uttar Pradesh.

**The Kumaun Himālaya** The main importance of the Kumaun Himālaya lies in the fact that the rivers Ganga and Yamuna have their sources here. This mountain tract covers about 38,000 sq. km. and contains the type areas of all the three Himālayan sections, the Siwālik, Himāchal (the Lesser Himālaya), and Himādri (the Great Himālaya). The Siwālik range proper, with its forest-covered slopes and flat summits rising 900 to 1,000 m. extends uninterruptedly for 74 km. between the Yamuna and the Ganga. The crest is generally formed of hard conglomerate and the lower gentler slopes of softer sandstones. From Hardwār to Rishikesh the Siwālik range appears to present a succession of dip slopes and escarpments. Behind the Siwālik range, structural depressions run parallel and are more developed in the west than in the east. Dehra Dūn on the west, a typical structural depression, is 75-km. long and 15 to 20-km. broad.

The Himāchal (the Lesser Himālaya) section of Kumaun comprises mainly two linear ranges, the Mussoorie and the Nāg Tibba. The former extends from Mussoorie town to Lansdowne, a distance of 120 km. and has a number of hill-stations of moderate heights (2,000 to 2,600 m.) on its summits. From Dehra Dūn it appears as an even-crested range with southern precipitous slopes. Mussoorie is said to be the queen among Himālayan hill-stations. Near Naini Tāl town there are several lakes or *tāls* of considerable beauty of which Naini Tāl and Bhim Tāl are the most notable. About 30 km. north of Naini Tāl is Rānikhet, another beautiful hill-station on a pine-forested ridge from which a grand view of the summits of Nanda Devi and Trisūl can be obtained across deep terraced valleys.

The Himādri (the Great Himālaya) section of the Kumaun Himālaya contains about 6,600 sq. km. of *himāls*, snow-fields. The Gangotri Himāl feeds the Gangotri and Kedārnāth glaciers and the Nanda Devi Himāl feeds the Milam and Pindari glaciers. The Gangotri glacier is 30-km. long, and each of its four tributaries is about 8 km. A grand view of the peaks of the Kumaun Himādri can be obtained from Badrīnāth. The Nilkantha stands directly above Badrīnāth, rising in a single awe-inspiring sweep to a beautiful snow cone summit. Nanda Devi (7,817 m.), the highest peak in the Kumaun Himālaya, stands within a vast amphitheatre-like valley, 112 km. in circumference, the average height being 7,000 m. A formidable serrated ridge, 3-km. long and 7,500 m.

high, links the western and eastern summits of Nanda Devi. Dūnagiri (7,066 m.) stands on the western end of the northern arm and Trisūl (7,120 m.) on the southern arm. There are other high peaks in the neighbourhood, Nanda Kot (6,861 m.), Nandākana (6,309 m.), and Nandāghunti (6,063 m.). The Nanda Devi group of peaks is drained by the Dhauliganga. Farther west lies the Kāmet Himāl with the towering Kāmet peak (7,756 m.) on the Zāskār range, a northern branch of the Great Himālaya. The Bhyundarganga, a tributary of the Vishnuganga, flows through a valley of roses. West of the Vishnuganga rises another group of peaks above Gangotri Himāl: Satopanth (7,084 m.), Badrīnāth (7,138 m.), Kedārnāth (6,940 m.), Gangotri (6,614 m.) and Srikanta (6,728 m.).

The main headwater of the Ganga is the Bhāgirathi. Its source at Gaumukh, an ice-cave, is taken to be the source of the Ganga as well. Sweeping westwards for 35 km. from its source, the Bhāgirathi turns south, cuts through the

Great Himālaya in a deep valley, and flowing for another 140 km. through the Lesser Himālaya receives another principal affluent, the Alaknanda, at Devaprayāg. The Alaknanda rises from a glacial snout of the Alakapuri glacier, just behind Badrīnāth town, and rushes as a mountain torrent until its course is blocked by an ice-avalanche. The river continues to flow beneath the ice. After its exit from the ice-barrier, the Alaknanda runs through a valley carved out of tectonic ridges. At Rudraprayāg it meets the south-flowing Mandākini, which has its source in Gaurikund and is fed by the melt-water of the Ghorābari glacier descending from the Kedārnāth peak. Both the valleys are V-shaped, representing their youthful age, and the valley slopes are terraced. Some of these terraces, like Gauchar between Rudraprayāg and Karnaprayāg, are so flat that they can be used as landing ground for aircraft. The combined rivers then take the name of Ganga. Flowing south for 70 km. and cutting through two ranges, the Nāg Tibba and the Siwālik, the Ganga descends to the plains at Hardwār.

About 25 km. west of the Bhāgirathi, the Yamuna rises from Yamunotri glacier, 10 km. west of Bandarpūnch peak (6,315 m.). It flows past the Yamunotri temple, and traverses the Lesser Himālaya for 75 km. till it is joined by the Tons on its right bank. The united river then pierces through the Siwālik range and comes down to the plains at Paonta. The eastern side of the Kumaun Himālaya is drained mainly by the Gauriganga and the Rāmganga, the affluents of the Kāli.

The Central Himālaya, about 116,800 sq. km. covers the whole of Nepāl and is drained principally by three great river systems, the Karnāli in the west, the Gandak in the middle, and the Kosi in the east. The central valley of Nepāl, where the capital city Kātmāndu is located, divides Nepāl into two parts. The Nepāl valley has been carved out of an anticlinal hill of metamorphosed sedimentary rocks, and the synclinal hills surrounding it in the north and south show inversion of relief. The majority of the "eight-thousander" peaks of the world are found in the Nepāl Himālaya. From west to east they are : Dhaulāgiri (8,172 m.), Annapūrṇa (8,078 m.), Manāslu (8,156 m.), Gosainthān (8,013 m.), Cho Oyu (8,153 m.), Mt. Everest (8,848 m.), Makālu (8,481 m.) and Kānchenjunga (8,598 m.). Everest, the world's highest peak, has a uniclinal structure, some 1,070-m. thick and composed of metamorphosed limestones and other sedimentaries. All these peaks are surrounded by vast snow-fields which feed a number of glaciers.

The Great Himālaya range as it enters Sikkim changes its strike and becomes easterly. It runs in that direction for 420 km.

The Sikkim Himālaya as far as Kangto (7,090 m.) and finally changes to north-east, terminating at Namcha Barwa (7,756 m.) at a farther distance of 300 km. There is only a narrow fringe of the Siwālik range along the southern border of the Himālaya; wherever the main Himālayan thrust advanced more to the south the Siwālik range became completely overridden and disappeared.

The Sikkim Himālaya includes a vast river basin, considerably deepened and widened by the Tista and its large affluents. Structurally, it is an anticlinal valley. Landslides and frost-shattered rocks make communications very difficult in the Sikkim Himālaya. Its western boundary is marked by the Singālila range, whose flat top as far as Phalūt makes it an easy route to Kānchenjunga and its two sister peaks, Kabru (7,316 m.) and Jano (7,710 m.). Kānchenjunga represents the core of an enormous recumbent anticline which has advanced southwards. The Dongkya range, forming the eastern boundary of Sikkim, is much serrated, and only two of its wide gaps, Natu La and Jelep La, are sufficiently smooth to provide trade routes between Sikkim and the Chumbi valley.

The Darjeeling Himālaya consists principally of two north-south ranges ; the Singālila range separates the Darjeeling District of West Bengal from Nepāl; the Darjeeling range rises abruptly from the *tarai* plains to the Senchal peak (2,615 m.). The former has the three highest peaks of the District : Sandakphu (3,630 m.),

Sabargam (3,543 m.) and Phalūt (3,596 m.). It is along the latter range that the Darjeeling-Himālayan railway runs in loops and spirals. Tea gardens are found interspersed with The Darjeeling patches of forests up to an altitude of 2,100 Himalaya m. A magnificent view of the snow-clad Kānchenjunga group of peaks can be obtained from Darjeeling on a clear day, and from the top of the Tiger Hill nearby one can have a glimpse of Mt. Everest in its full splendour. The Darjeeling Himalaya is drained from west to east by the Mechi, Bālāsan, Mahānanda, Great Rangīt and Tista, the last being the largest. The basin of the Tista within the hills has an oblong shape, the longer axis trending north-south. Its valley has been carved out of softer slates and schists. South of its confluence with the Great Rangīt, the Tista flows along the axis of a transverse anticline.

The Bhutān Himalaya covers about 22,500 sq. km. of deep valleys and high ranges. The topographic features change rapidly within a short range, so that their influence on The Bhutān Himalaya climate is pronounced. The intense cold of Siberian winter, the terrific heat of the Sahara desert and the mild pleasant weather of Mediterranean Italy may all be experienced in the course of a single day's journey in Bhutān. The Siwālik range reappears in Bhutān to the east of the Torsa river and extends to the entire length of the State. The Bhutān Himāchal consists of transverse ranges trending southwards. Of these, the Masang Kyungdu connected with the Chomo Lhāri peak (7,314 m.) and the Thimphu extending from the Lingshi peak (5,653 m.) deserve mention. Two passes on the latter range, the Lingshi La and Yule La, provide routes to the Chumbi valley of Tibet. To the east of the Thimphu range runs the Punakha valley, the floor of which is extremely rugged.

The easternmost stretch of the Himālayas lies in the NEFA area of Assam. All the three sections of the Himālayas are represented here, covering about 67,500 sq. km. Like The Assam Himalaya, this part has a great diversity of scenery within a comparatively narrow confine. The forested Siwālik hills rise abruptly to 800 m. above the Brahmaputra valley. Most of the ranges of the Lesser Himalaya are clothed with temperate forests and do not appear to have any control over the drainage system. The trend of the Assam Himādri (the Great Himalaya) is northeast-southwest, and many of its peaks rise to over 6,000 m.

The Dihāng (or Siāng) after its union with the Dibāng and the Luhit takes the name of Brahmaputra. This river rises from

the snout of the Chemayungdung glacier near the Tachhog Khabab Chhorten, about 100 km. south-east of the Mānasarowar, and near its source it is called Tachhog Khabab. The Brahmaputra It runs eastwards for 1,250 km. in a shallow valley through Tibet, takes the name Tsango before making a sharp turn southwards, and cuts through the deep gorge of Dihāng.

This physiographic region is not all mountainous. It includes low hills, plateaus and even plains. Folded mountains of Tertiary sedimentaries occur mainly in the NEFA and the Nāga hills. Low sandstone hills mark the topography of the North Cāchār hills. The Cherrapunji plateau of the Khāsi hills is a classical example of structural platforms in India. The Assam valley is flanked by high mountain ranges both on the north and the south. The north-eastern mountains may, therefore, be subdivided into three physiographic provinces: the Pūrvāchal, the Meghālaya plateau and the Assam valley.

The Pūrvāchal includes not only the lofty ranges which border India in the north-east, but also the hills and plains in Manipur, Tripura and the adjoining Districts of Assam. It may be further divided into six sub-provinces: Pūrva-NEFA, Nāgāland, the Manipur hills, North Cāchār hills, Mizo hills and Tripura hills.

Pūrva-NEFA has two major sections—the Mishmi hills and Pātkai Bum (range). The former contains the loftiest ranges of Pūrvāchal with many summits rising above 5,000 m. There are several basins. The largest, Taroan basin, is surrounded by snow-clad ranges with altitudes of 3,000 to 5,200 m. and traversed by several south-flowing tributaries of the Tellu river (the Luhit). Dapha Bum (4,578 m.) is one of the high peaks of the Mishmi hills lying south of the Luhit river.

Many of the peaks of the Pātkai Bum rise between 2,000 and 3,000 m. The range itself is built of strong sandstones of the Tipam series and has a synclinal structure, the axis of the syncline being roughly coincident with the crest of the range. The slopes of the range are clothed with dense forest. It was during the last war that a metalled road was constructed over the Pātkai, connecting Assam valley with the Hukawng valley of Burma. However, the pass through which it runs had served as a link between Burma and Assam ever since the 13th century.

Nāgāland is bordered on the east by the Nāga range, which (like the Pātkai) forms the watershed between India and Burma. The Tizu is the only river that has cut through the Nāga range and flows east to the Chindwin river of Burma. Saramāti is the

Nāgāland highest peak (3,826 m.) on the Nāga range and there are other peaks over 3,000-m. high. Farther west are the Kohima hills, the highest peak of which is Japvo (2,995 m.) The country rock is hard slaty shales of the Tertiary and pre-Tertiary age; on weathering it has given rise to a very rugged topography. The range-and-valley type of topography dominates the greater part of the Kohima hills. Serrated ridges dotted with dense forests are found to alternate with deep valleys containing fast-flowing rivers. The drainage is of the trellis type because of the folded structure.

The ridge-and-valley character of the eastern mountains becomes more pronounced in the Manipur hills, which extend from the Tuensang hills in the north to about 24° N. parallel in the south. Their eastern boundary runs along the frontier between India and Burma, and the western boundary abuts against the Cāchār plains and hills. The central part is a large basin, 50-km. long and 30-km. broad, surrounded on all sides by high mountains. This appears to be the bed of an old lake, a remnant of which occupies the south-east corner of the basin and is known as the Logtāk lake, 12-km. long and 8-km. broad. It has centripetal drainage. The lake is finally drained by the south-flowing Manipur river. The hill ranges on either side of the valley run practically to the same height, a little over 2,500 m. and have flat rolling tops. The Barāk is the largest river in the Manipur hills. It rises from the Japvo peak and flows south-west for 180 km. parallel to two ranges lying on either side, before turning its course first to the north and then to the west through the Cāchār plains.

A belt of hills and plains separates Nāgāland and the Manipur hills of the Pūrvāchal from the Meghālaya plateau. Along The Barail range its eastern border runs a very prominent range of Assam, the Barail, overlooking the Dhansiri valley in the north and the Silchar plains in the south. Composed of strong sandstones of the Oligocene age, it presents a hogback structure towards the western plains and merges imperceptibly with the Kohima hills on the east. Its summits are jagged and the slopes clothed with dense forest. This accounts for the very sparse population in the Barail range.

The greater portion of the hilly belt between the Meghālaya and the north-eastern ranges is known as the North Cāchār hills.

North Cāchār hills This physiographic section slopes gently northwards and is drained by the Diyung, a tributary of the Kopili river. The average elevation is 500 m., though here and there peaks rise to over 1,000 m. Sandstones and

conglomerates of the Surma series form the bulk of the North Cāchār hills. These, on weathering, have given rise to very rugged topography.

A more extensive plains section, very thickly populated, lies in Cāchār to the south of the Barail range. The valley plain has an average elevation of 75 m. and is intersected by two transverse hills, the Rengtipahār and the Tilain, which enclose a low marshy tract called Chatla Hāor. The Barāk or the Upper Surma flows westwards through the middle of this section. It is 100 to 200-m. wide and 25-m. deep, and receives a number of tributaries, mainly from the south.

The southern part of the north-eastern ranges, the Mizo hills, used to be known as the Lushai hills. Long, north-south trending parallel ranges and intervening valleys are a feature of this section. A traverse from the Tripura border in the west to the eastern frontier along  $23^{\circ} 45'$  N. parallel will reveal the presence of eight smaller ranges and an equal number of valleys. Most of the ranges are of the cuesta type, and the slope is much steeper in the west than in the east.

The Tripura hills comprise long ranges alternating with valleys. This range-and-valley type of topography has rendered communications very difficult and the transport problem in the region has been accentuated since the creation of Pākistān, which almost encircles it. The Tripura hills can be divided physiographically into four valleys named after the towns of Dharmanagar, Kailāshahar, Kamalpur and Khōwai, and one upland named after Agartala. The Gumti is the largest river. It receives a number of south-flowing streams and cuts right across the ranges in a steep-sided valley from east to west before emerging out of the hills near Rādhākishorepur. There are a number of waterfalls in its channel through the Dumbura hill, and the landscape in the neighbourhood is exceedingly picturesque.

The Meghālaya plateau, though now a part of the north-eastern ranges, is really an eastward extension of the massive block of Peninsular India lying to the east of the great gap in the Archaean terrain, subsequently filled up with alluvium deposited jointly by the Ganga and the Brahmaputra. This ancient land was submerged partially by the encroaching sea during the Mesozoic and early Tertiary times and was uplifted slowly from the bed of the sea at the time the Himālayas rose from the floor of the Tethys. The orogenic movement was so slow and free from buckling that the sedimentary beds retained their horizontal character and gave rise to structural

platforms, well developed in the Cherrapunji area. From the Surma valley in the south, the central and eastern parts of the Meghālaya appear as an imposing tableland, bordered by a great scarp and sloping steeply towards the plains. Waterfalls rush down the scarps and carve deep valleys through which swift-flowing rivers descend to the plains. It is the ascending monsoon clouds over the frontal slopes and the side valleys that have made Cherrapunji world famous as the meteorological station that records the highest rainfall, and they account for the regional name, Meghālaya (*megha*, cloud, and *ālaya*, abode). Physiographically and administratively as well, the central and eastern parts can be grouped together under the name Khāsi and Jaintia hills; and the western part, the Gāro hills, are lower in elevation and rise more gently from the southern plains.

This hilly tract covers 8,180 sq. km. and has enabled the Brahmaputra to change its course from west to south along its western edge. The Surma plains with their marshes Gāro hills and meandering streams lie at its southern foot. The

Tura range and the Simsāng valley are the two most important physiographic units of this region. The Tura range extends from Tura town to Siju, a distance of 50 km. and contains the highest peaks of the Gāro hills: Nokrek (1,412 m.), Megonggiri (1,283 m.), Meiminrām (1,196 m.), and Gowangdāra (1,011 m.). It is a typical horst, bounded by two fault lines. Along the northern fault line flows the Simsāng river eastwards for about 45 km. before turning south through a deep valley, separating the Tura range from the Kylās range, and ultimately coming down to the plains near Bāghmāra. In the plains this river is called the Someswari.

The central and eastern parts of the Meghālaya cover 14,375 sq. km. Physiographically, it may be subdivided into three sections : the northern hills; central plateau; and Khāsi-Jaintia hills southern hills. The northern section has an undulating topography—hill after hill rising almost to the same height and extending northwards to the Brahmaputra. The accordant summits of these hills vary between 170 and 820 m. The Nongpoh village, lying half-way between Shillong and Gauhāti, stands on the flat top, 700-m. high, of a typical hill of this section.

The central plateau of the Khāsi hills covers about 5,000 sq. km. its outer limit defined roughly by a 1,500-m. contour line. It contains remnants of seven peneplaned surfaces, ranging in height from 1,500 m. to 2,083 m. The Shillong hills towering above Shillong town contain the highest peneplaned surface, trending E.S.E.-W.N.W., over which streams meander before plunging into the deep valleys of the Umiam and the Umkhen. The presence

of many rapids and waterfalls in the neighbourhood of Shillong town indicates that this region has a youthful topography due perhaps to a recent uplift. To the south of the Shillong hills around Mylliem occurs a typical granitic topography with rounded hills and shallow valleys. Farther south occurs a vast structural platform on which stands Cherrapunji. This part of the central plateau is built of gently dipping sandstones of the Cretaceous age, and over its edge the magnificent Mawsmai waterfalls add to the scenic beauty. Small, rounded limestone hills of the Eocene age are found scattered all over the Cherra plateau; some of them contain small caves with narrow underground passages and characteristic cave deposits. From Cherrapunji the plateau slopes very gently southwards for about 6 km. and then falls rapidly to the plains, the ground slope conforming to the high dip of the sedimentary rocks.

The easternmost section of the Meghālaya, the Mikīr hills, extend from the west-flowing Jamuna river, a tributary of the Kopili, almost up to the Brahmaputra valley. These Mikīr hills hills also are rugged and thinly populated because of strong sandstones of the Surma series which underlie them. Shales of the Barail series, exposed in valley bottoms, help to widen the valleys. Hence, there is some concentration of population in this region. Chenghehishon (1,359 m.) is a dome-shaped peak with radial drainage. North of this peak there are several hot springs. Kāziranga on the northern margin of the Mikīr hills has been developed as a sanctuary for wild animals.

The Kopili river rises from the southern flank of the Barail range near Sherpai peak and flows first through hilly country for 90 km. along the common border between the The Kopili Jaintia and North Cāchār hills, and then meanders for another 90 km. before joining the Kalang, a branch of the Brahmaputra. Lumding, an important gap town, stands at the head of the Kopili plain through which roads and railways pass, connecting the Dhansiri valley with the Kopili basin. The lower reaches of the Kopili after its confluence with the Jamuna river are densely populated.

The source of the Dhansiri is on the Barail range, not very far from the source of the Diyung. It flows for about 300 km. through a funnel-shaped valley, entering the Brahmaputra at Dhansirimukh. In the upper reaches it receives many tributaries from the Barail range and becomes a large river at Dimāpur. The valley then widens, both the Nāga hills in the east and the Mikīr hills in the west receding from the river. It is 50-km. wide near Golāghāt and very flat.

and densely populated, especially on its right bank towards the Nāga hills.

The valley of Assam is linked with the Ganga plains by the plains of North Bengal. It owes its present form to the aggradational work of the Brahmaputra. This river Assam valley: carries more water than any other in India, but the the Brahmaputra channel, filled with sand, is not deep enough to carry the enormous volume of water. Floods normally begin in May with the thawing of snow in Tibet and the Eastern Himalaya, and they are aggravated by the monsoon rains pouring incessantly from June to September. The rise in the level of water in the parent stream prevents the waters of tributary streams from entering into the main river. That leads to the rise of water-level in the tributary streams, causing widespread floods. As the floods recede, marshy areas grow near the confluence of the tributaries with the Brahmaputra.

The densely populated Assam valley extends for about 600 km. from Sadiya on the east to Dhubri on the west, where the Brahmaputra turns southwards and skirts the western edge of the Gāro hills. The Assam valley may be divided physiographically into two parts, Upper Assam and Lower Assam, each about 75-km. wide, with low relief, easy accessibility and extreme fertility of the land. Since the northern slopes of the upper Brahmaputra are marshy, lowlying and subject to annual floods, they are very sparsely populated. The southern slopes, on the other hand, rise above the flood plains and have many villages. To the north of the Lower Assam valley stretches the Eastern Duārs from west to east, and well developed in the Goālpāra District. It is a flat terrain clothed with dense forests and high grass and has scattered settlements on forest clearings. Farther south, the arable land is well drained and interspersed with large alluvial lakes (*bīls*). The city of Gauhāti commands a fine view of the valley.

### *Great Plains*

In front of the Himālayas stretch the Great Plains of India, fanning out at both ends, so as to include the Ganga delta on the east and Rājasthān arid and semi-arid plains on the west. The central and eastern parts have been built up by the Ganga and its tributaries. The Punjab plains occupy the western part of the Great Plains where the tributaries of the Indus flow in a south-westerly direction in contrast to the south-east flowing Ganga and its tributaries. Arid conditions have set in over the southern part

of Punjab and continue more forcefully in West Rājasthān, which though originally a part of the Indo-Ganga plains is passing today through a different landscape cycle; this section of the Great Plains forms a distinctive region, called Western Arid Plain.

The Great Plains are one of the newest physiographic units. They are even newer than the Himālayas which have contributed to their making. The northern boundary of the Great Plains is well-defined, but their southern boundary follows a crenelated line along the northern edge of the Central Highlands. It is believed that there was a deep depression in between the Himālayas and the Central Highlands up to the Pleistocene times; the detritus brought down by the Himālayan and Vindhyan rivers slowly filled this up. The depression, which was the fore-runner of the Great Plains, might have been formed by the bending down of the southern rigid mass against the onrush of the Himālayan folds; or it might have been a simple rift valley at the northern edge of the Central Highlands. Whatever cause gave rise to the original trough, its subsequent history is more important to us.

The Great Plains are an alluvium-filled trough. In other words, they are a classical example of an aggradational plain, the depth of which varies from place to place, perhaps nowhere exceeding 400 m. The thickness of the alluvium is probably at its maximum in the Ganga plains and at its minimum in the western plains. Since the nature of detrital deposits is the same from the top to the deepest known part, it is presumed that this alluvial trough has been subsiding since the Pleistocene age and thus an isostatic balance could be maintained between the rising Himālayas and the sinking trough. The total area of the Great Plains is 652,000 sq. km. of which one-third lies in the arid Western Rājasthān. Another one-third lies in Uttar Pradesh; and three other States, Punjab, Bihār and West Bengal, have more or less equal shares. The Great Plains are bordered in the north by two narrow belts from end to end. First, there is a piedmont plain, known in Punjab as *bhābar*; coarse pebbles are intermixed with finer and extremely pervious detritus, so that the smaller Himālayan rivers disappear underground on reaching this region. Next, there is a marshy tract, *tarai*, where the hidden rivers emerge on the surface and flood the country-side. Most of the Great Plains, however, are composed of alluvium deposited during the Middle Pleistocene and recent geological time. The older alluvium, known as *bāngar*, forms invariably higher ground in the interfluve areas, and the newer alluvium, called *khādar* in Uttar Pradesh and *bet* in Punjab, form the lowlying flood plains adjacent to river banks.

The regional slopes of the Great Plains are mainly in two directions, south-east and south-west, and the general shape conforms to the trends of the mountains lying north, west and east. It is mainly under the influence of the Himālayas that the plains extend from west to east, and they have developed regional slopes because of the underlying Arāvallis in the west and the buried Rājmahāl-Gāro hills in the east. The surface of the Great Plains is at tide level near the mouths of the Ganga but in the Punjab plains it is well over 200 m. above sea level. This difference in height from east to west, coupled with the difference in rainfall which is much higher in the east than in the west, has relieved considerably the monotony of the plains landscape. The master streams of the Great Plains are the Ganga and the Indus, the lower reaches of which now flow outside the limits of India. The Ganga and the Indus have a number of large tributaries which flow parallel for a good distance before the confluence. This indicates that they also are consequent streams and the tracts over which they flow represent the original surface. None of the tributaries of the Ganga or the Indus now flows through the arid plains in the west.

The drier plains of Punjab extend southwards and merge imperceptibly into the arid plains of Rājasthān. This physiographic region extends for 640 km. from north-east to south-west with an average width of 300 km. from west to east covering 175,000 sq. km. It has a well-defined boundary on the east, marked by the Arāvalli range. This tract has two regional slopes, westwards to the Indus valley and southwards to the Rann of Kutch; and the latter was the main outlet of the Rājasthān rivers before the advent of arid conditions in this part of India about 1,000 years ago. More than one-half of the surface rises between 150 and 300 m.; and about one-third, lies to the east of Bikaner, between 300 and 500 m. A few rocky hills to the south of the great bend of the Lūni rise even to about 1,000 m. West of Jaisalmer, the ground level falls to below 100 m. and the lower Lūni valley is the most lowlying part of this region, hardly rising above 20 m.

Though a part of the Indo-Ganga plains, this region follows a life-cycle different from that of other plains, since the wind has taken an upper hand over the flowing surface water in the landscape evolution. The country is often described as desert, but detailed investigations of surface features, ground-water conditions and forest flora reveal that it is not really a desert. The fact that a good harvest of wheat, *jowār* and *bājra* can be raised wherever water is obtained either from wells or from canals

supports this statement. It is also not uncommon to find in the monsoon months large patches of luxuriant grass affording pasturage to herds of cattle and flocks of sheep. A region of moving sands and deficient rainfall, its ancient name Marusthali is more appropriate than the present name, Thar desert. The eastern part is more humid, less sandy, and clothed with steppe vegetation. Almost the whole of the arid plains was under the sea from the Permo-Carboniferous to the Pleistocene times. It was uplifted during the Pleistocene times and then a normal cycle of erosion started as in the other parts of the Indo-Ganga plains. Its productivity in the past depended on the Sarasvatī, Drṣadvatī and Sutlej rivers. The dry bed of the Sarasvatī, 10-km. wide, now called the Ghaggar, can be traced from 25 km. east of Hanumāngarh to 15 km. west of Anūpgarh. It is joined by another dry valley, supposed to be the Drṣadvatī, 15 km. east of Sūratgarh. The Sutlej then joined the Sarasvatī river system; a dry bed about 10 km. east of Hanumāngarh is believed to be the old bed of the Sutlej.

The Lūni (or Salt River) is the only living river of the arid plains, and in years of deficient rainfall this carries a mere trickle of water. It issues from the Ana Sāgar, about 5 km. south-west of Ajmer, and flows westwards for 450 km. before entering the Rann of Kutch. The river water is sweet as far as Bālotra, then turns brackish, and by the time the river reaches its mouth the water is quite salty. There is a small delta at the mouth of the river, formed at a time when it used to carry more water. The Lūni receives only one tributary, the Sukri, besides a number of short streams flowing down the western slope of the Arāvalli. The need for water in Western Rājasthān is so great that even this one river had to be dammed near Bilār for constructing a reservoir, known as Jaswant Sāgar, which provides water for irrigating about 5,000 hectares of arable land.

The ground-water in the greater part of this arid land is impregnated with salt, though patches of porous layers holding sweet fossil water lie below the surface in juxtaposition with layers containing brackish water. This indicates that under more humid climatic conditions in the past, rain-water sank underground and remained sealed up. There are a number of salt lakes in this arid region, of which the Sāmbhar is the largest. It lies astride the Arāvalli range, 60 km. west of Jaipur town, covering 300 sq. km. during the rains, and in the dry months its surface is encrusted with dazzlingly white saline soils. The two other important salt lakes are Didwāna, 80 km. north-west of Sāmbhar town, and Pachpadra, 10 km. north-west of Bālotra. The Lūnkarsar Tāl,

70 km. north-east of Bikaner, also deserves mention. Salt is manufactured from the brine of these lakes to the extent of 480,000 tonnes per year, mostly from the Sāmbhar lake.

Generally speaking, Western Marusthali is sandy and Eastern Marusthali rocky. A 100-km. wide strip along the western border of Rājasthān between the parallels of 26° and 29°N. Marusthali includes more than three-fourths of the sandy desert.

Here the annual rainfall is the least, 100 to 200 mm. per year. The region is covered almost everywhere with shifting sand-dunes, locally known as *dhrian*. West of Shāhgarh, these dunes run in chains and are of a very complex type, the longitudinal type predominating. It is in the 'blow-outs' of the sand-dunes that man could get some foothold. The main characteristics of Western Marusthali are to be seen near Jaisalmer town which stands on a rocky plain carved out of Jurassic sandstones. Short, intermittent and discontinued streams traverse the Jaisalmer plain. Their dry beds and banks could easily be tapped for ground-water and wherever water supply was assured, settlements sprang up. To the north of Jaisalmer a number of playa lakes designated as Ranns occur in basins more or less rimmed by low scarps. These lakes, though fed by centripetal drainage, remain dry for the greater part of the year. South and east of 26° parallel N. the sand-hills continue but they are mainly of the barchan or transverse type. In the Barmer region the barchans rise 50 to 100 m. above ground level and cannot be easily shifted by the wind. The railway line running from Barmer to Bhimarlāi and farther east crosses a number of such barchans interspersed with shallow basins.

A belt of steppe country stretches westwards from the foot of the Arāvalli range and merges imperceptibly into Marusthali.

Rājasthān  
Bāgar

It contains less sandhills and is drained by innumerable short watercourses. The more fertile tracts are called *rohi*. Several large patches of *rohi* land occur in the northern and central parts of this region. The Gang plain at the northern end and the Godwār plain within the Lūni basin at the southern end are agriculturally the most productive parts of the Bāgar land; one is intensively irrigated by the Gang Canal and the other is fed by the headwaters of the Lūni river. The highest group of hills in Western Rājasthān occurs in this region, to the south of the great bend of the Lūni. Parts of the hilly region are buried under sand, though there is evidence to suggest that it represents fluvial landscape carved out by the former powerful rivers, modified by the aeolian erosion later.

Extending from the west of the Yamuna river on the south east to the Rāvi on the north-west, this physiographic province

conforms to the present State of Punjab. It slopes southwards, being perhaps tilted in that direction by the northward extension of the Arāvalli, now buried under alluvium, and Punjab plains owes its origin and importance primarily to the aggradational work of the Sutlej, Beās and Rāvi

of the Indus river system. The Sutlej flows westwards for 200 km. through the Ludhiāna and Jullundur Districts, turns south-westwards, and traverses another 1,100 km. of Indian territory. There is evidence to suggest that the

The Sutlej      Sutlej was a much bigger river in the past when it flowed farther east as an independent river through Punjab and Rājasthān, receiving waters from the Yamuna and entering into the Rann of Kutch. Its former banks can still be

The Beās      traced ; during prehistoric and early historic times they had prosperous settlements. The Beās flows for 150 km. through the Punjab plains and then joins the Sutlej near Sultānpur in the Jullundur District. Formerly, the Beās used to flow through an independent channel farther west

The Sarasvatī      towards the Rāvi river, the smallest and western-most river of the Punjab plains. There were two other great rivers, Sarasvatī and Dṛṣadvatī. They dried up almost completely by 1,000 A.D. when arid conditions had become established.

The Punjab plains are remarkably flat, and with the exception of the Hoshiārpur plains the general elevation varies between 200 and 240 m. Narrow strips of lowlying flood plains, known as *bets*, are easily distinguishable. Formed by the shifting of river courses, they range in width from 1 to 12 km. Steep bluffs, 5 to 10-m. high, separate the higher plains, the *bāngars*, from the adjoining *bets*. The Doāb plains occupy the north-eastern part of this region. Between the Rāvi and the Beās lies the northern part of the Bāri Doāb with Amritsar as its central point. The lowlying flood plains of the Beās are subject to annual floods and are sparsely populated. Farther east, between the Beās and the Sutlej, lies the Bist Doāb, the most developed part of Punjab. To the south of the Bist Doāb is the Mālwa plain. It has all the features of the drier parts of the Punjab plains—thirsty land with fixed sand-dunes of various shapes and sizes. The east-central plains receive higher rainfall and have a fertile light loamy soil. Farther south lies the Hariāna plain, once a rich and fertile tract through which the Sarasvatī used to flow in earlier periods. The two other sections, the Bhiwāni Bāgar and the Rewāri upland, are typical semi-arid steppe-like plains with deep water-tables and shifting sands.

The Ganga plains occupy about 357,000 sq. km. and lie in Uttar Pradesh, Bihār and West Bengal. The Yamuna flows near the western boundary of this tract for 800 km. and eventually joins the Ganga at Allahābād. The region between these two rivers is the Ganga-Yamuna Doāb. North of the Ganga the alluvial plains are further subdivided into Rohilkhand in the west and Avadh in the east. Further east, the alluvial plains of Bihār make two sections in the north and the south, each with a distinctive character. The eastern portion of the Great Plains comprises two other regions, the Bengal basin and the North Bengal plains. The former includes the present Ganga delta and the latter, an old delta of that river.

The Himālayan portion of the Ganga has already been described. The people of India owe so much to the Ganga that they hold it in supreme reverence as a goddess.

The Ganga Emerging out of the Himālayas near Hardwār, the Ganga flows majestically for 1,200 km. eastwards, turns south, then flanks the eastern face of the Rājmahāl hills. Near Dhuliān the waters divide. One branch passes into East Pākistān, the other flows through Indian territory under the name of Bhāgīrathi or Hooghly and enters the Bay of Bengal at the southern tip of Sāgar island. The lower reach, about 300-km. long, does not carry enough water because of the eastward shifting of the river. This has created problems for the port and city of Calcutta, and the solution seems to be the building of a barrage at Farakka. All through its course in the plains the Ganga flows along a braided channel with sandbanks and is bordered on either side by lowlying depressions which get flooded during the rains. The river receives two important tributaries on its right bank, the Yamuna and the Son, and three on its left bank, the Ghāghara (Sarju), the Gandak and the Kosi.

For the greater part of its course the Yamuna flows between high banks, considerably dissected at places by gully erosion. It runs for 800 km. parallel to the Ganga and joins The Yamuna it at Allahābād, having received a number of tributaries from the Central Highlands on its right bank: the Chambal, Sind, Betwa and Ken.

Of all alluvial tracts between two rivers (*doāb*), the Ganga-Yamuna Doāb is by far the largest and most densely populated.

The Ganga-Yamuna Doāb It has been divided into three sections, Upper, Middle and Lower, on the basis of rainfall, elevation and character of older flood plains. The Upper Doāb extends from Hardwār on the north to Aligarh on the south. It has a gentle slope southwards; the elevation near Sahāranpur

is 274 m. near Meerut 224 m. and at Aligarh 186 m. A number of minor streams between the two master streams flow through this section and help in improving the drainage conditions—of these, the Hindan is the largest. The *khādar* and *bāngar* strips diversify the topography, though the boundary between them is not well-defined along the course of the Yamuna. The *bāngar* of the Ganga is well developed and terraced. One such terrace almost overlooks the Ganga in the Bulandshahr District and protects the riverine land from floods. But wherever the *bāngar* terraces have receded from the Ganga as in the Meerut and Muzaffarnagar Districts, floods submerge large tracts practically every year. The Upper Doāb is heavily irrigated by the Eastern Yamuna and Upper Ganga Canals. Rainfall is also much heavier here than in other *doābs*, ranging from 600 mm. in the south to 1,000 mm. in the north.

The 200-m. contour line may be taken as the boundary between the Upper and Middle Doābs and the 100-m. contour line between the latter and Lower Doāb. The regional study of the micro-relief between these two stations reveals that the gradient steepens below 150-m. contour line until Kānpur is reached and then flattens out. Another feature of the surface is the development of secondary transverse slopes on older flood plains. Four broad asymmetrical swells interrupt the otherwise even skyline in the Middle Doāb as one proceeds from the right bank of the Ganga to the left bank of the Yamuna via Etah and Shikohābād. Further south, the inter-stream swells decrease in number and flatten out considerably.

The Lower Doāb proper is still more flat, though the crests of its two swells rise a little higher than those of the corresponding swells in the transitional area. The absence of dendritic drainage pattern is due to the extreme flatness of the surface. This also accounts for the parallelism of all the major and minor streams. Unlike the Yamuna, the Ganga is a braided river with a number of channels and sand-bars. Its aggradational character is well displayed at its confluence with the Yamuna at Allahābād; the clear stream of the Yamuna mingles with the muddy waters of the Ganga.

East of the Ganga-Yamuna Doāb is another vast stretch of alluvial plains, from the foot of the Himālayas to the Ganga. Its eastern limit is not well-defined as it merges imperceptibly into the Avadh plains. This section lies entirely in Uttar Pradesh, covering about 35,000 sq. km. The regional slope is to the south-east and the Rāmganga, Gomati and Sārda flow in that direction. The level of the land

Rohilkhand  
plains

increases from 132 m. on the east to 274 m. on the west. The *bhābar* and *tarai* plains are well developed in the north.

The major portion of the lowland north of the Ganga, gently sloping eastwards, comes within this physiographic region. A secondary slope towards the south has also developed, especially in the northern part of the region, due perhaps to a slight local tilt. Belted strips of *khādar* and *bāngar* are very conspicuous in the three plains into which this area is subdivided: Pūrabiya, Sarjūpār, and Gomati plains. The Ghāghara is the master stream traversing the whole length of the Avadh plains in a wide sandy bed. Its numerous bars and channels suggest that it is an aggrading river and has been continually shifting its course within a belt of about 55 km. in places. Another consequent river, the Rāpti, joins the Ghāghara near Dohrīghāt, and unlike the Ghāghara it transports more silt and makes its flood plains very productive. The Gomati is a sluggish stream, with an intricate series of meanders, and its banks, wherever high, confine the river within its bed even when the river is in flood.

The Avadh plains end in Uttar Pradesh and the next stretch of the Great Plains lies in Bihār, covering about 88,000 sq. km. The Bihār plains here are narrowed eastwards by the prolongation of the Rājmahāl hills and the two parts lying north and south of the Ganga differ in relief and river conditions.

This physiographic region is a land of rivers. The Ganga flows majestically along its southern border, receiving on its left bank three of the major Himālayan rivers, the Ghāghara (Sarju), Gandak, and Kosi, and a large number of mountain streams from the north. The combined work of these streams has resulted in a 2,000-m. deep trough at the foot of the Nepāl Himālaya being filled up with alluvial deposits. One of the most extensive alluvial plains of the world, 54,400 sq. km. in North Bihār, was thus formed. The general slope of the plain is towards the south-east in the western part and south in the eastern part, averaging 20 cm. to the kilometre. A long line of marshes extends from a little east of Chāpra to near Khagaria, parallel to the Ganga, locally known as *caurs*. Some of them are deep enough to contain water throughout the year (e.g., the Kābar Tāl). South of the *caurs* the surface rises towards the Ganga, traces of natural levees marking its former bank.

West of the Rājmahāl hills, the South Bihār plains increase in width to a maximum of 120 km. The dominant regional slope

of this physiographic region, about 9 cm. per kilometre, is towards the north or north-east. The monotony of the North Bihār landscape is relieved here, though at least two of the

South Bihār plains essential features of the north are repeated. The south bank of the Ganga is equally high and on its outward side occur vast depressions designated as *jālā* near Patna and *tāl* farther east near Mokameh; at its south the courses of the smaller north-flowing streams are deflected eastwards.

The plains in North Bengal cover 23,000 sq. km. extending from the foot of the Eastern Himālaya to the northern limit of

North Bengal plains the Bengal basin. Its eastern part is drained by the rivers joining the Brahmaputra, and the western part by the tributaries of the Ganga. This region has evolved from an extensive sheet of waste materials brought down from the Eastern Himālaya by a number of powerful streams like the Tista, Jaldhāka and Torsa, and its northern fringe known as the Western Duārs is most typical. Well drained it constitutes the ideal home of tea plantations wherever soils have been improved and other facilities provided. South of the Duārs the plains are more flattish and get waterlogged during the rains. Farther south lies the older delta of the Ganga formed during the Pleistocene time and subsequently upwarped and eroded into terraces. This is the Bārind plain.

The Bengal basin embraces most of the alluvial plains of West Bengal and East Pākistān. It is so flat and so low that a mere six-metre rise of the sea level would submerge

Bengal basin Calcutta and its environs. The Ganga delta occupies the major portion of the Bengal basin. Like any other great delta of the world it has a web of distributaries near its seaward face, and shallow tidal depressions near Calcutta contain salt water. The delta has its seaward face influenced more by the tidal estuaries and less by the waves, with the result that the indented coastline is a maze of sandbanks, mud-flats, mangrove swamps, islands and forelands. The heavily forested Sundarbans in the south and the East Bhāgīrathi plain in the north with its dead and dying rivers offer contrasting features.

The lowland to the west of the Bhāgīrathi, though not a part of the delta proper, is equally flat. The natural levees, strength-

Rārh plainened by the artificial embankments which border the Dāmodar and other rivers of this area, are characteristic. When the rivers are in flood, these often get breached and the entire country-side is submerged. From 50-m. contour line the surface of the Bengal basin rises and the landscape changes with the appearance of older alluvium. This

is the Rārh plain. Erosion has carved broad undulations out of this plain and long weathering has given rise to lateritic soils. The east-flowing rivers have cut deep into the Tertiary surface and deposited newer sediments on their flood plains, giving rise to terrace-like flats on their slopes.

### *Central Highlands*

A wide belt of hilly country bordered on the west by the oldest tectonic mountain of India and on the east by a great escarpment constitutes the Central Highlands, which separate the Great Plains of North India from the plateaus and coastal plains of the Deccan. About one-half of Madhya Pradesh, one-third of Rājasthān and a small portion of Uttar Pradesh lie in this physiographic division. It forms a compact block of mountains, hills and plateaus, interspersed with valleys and basins, covering about one-sixth of the total area of India. Much of it is forested and is the homeland of aboriginal tribes—Gonds, Santals, Oraons and Bhils. From west to east the northern part of the Central Highlands may be further subdivided into (i) the Arāvalli range; (ii) the East Rājasthān upland; (iii) Madhya Bhārat Pathār; (iv) Bundelkhand upland. Four other regions, the Mālwa plateau, Vindhya scarplands, Vindhya range and the Narmada valley lie in the south.

The present-day Arāvalli extends from Delhi south-west to near Ahmadābād for a distance of about 800 km. Near Delhi it has been reduced almost to the level of the alluvial plain, though still retaining its rocky character, and is known as the Delhi Ridge. At the southern end it has been much more dissected, with the result that a few scattered buttes rising hardly above 60 m. are all that remains of the mighty Arāvalli. In the past, the entire length of this range was a complete barrier to all kinds of movement from east to west; today, the effectiveness of the barrier is felt only in the central and southern parts. In the north, many wide water gaps run transverse to the range as far south as the Sāgarmati river near Nasīrābād, facilitating easy movement of all kinds of traffic and even sands from the western arid plains to the eastern humid plains. It is only to the south of Beāwar that neither railway nor highway crosses the Arāvalli, and all movements are restricted to passes of which four deserve mention, the Barr, the Pipli Ghāt, the Dewair and the Desuri. Because of its abrupt rise from the plains and its hard quartzitic rocks, the Arāvalli provides a rather

unfavourable environment for man. On the range itself villages are few and far between, and in many cases settlements consist of a few homesteads, erected either on forest clearings or in depressions between rugged quartzitic ridges.

South of Delhi, a long narrow ridge of hogback type extends for about 70 km. from Sohna to Rāmgarh, rising to the maximum height of 404 m. It widens out southwards in a fan-like form embracing the hills of Alwar. Here the topography consists of hogback quartzitic ridges, synclinal valleys and erosional valleys carved out of softer phyllite rocks. The ridges rise to a uniform height of 600 m. and stand out like ribs criss-crossing the lowlying plains, and wherever Alwar phyllites form the country rock a rolling type of topography has resulted.

South of Beāwar the Arāvalli becomes a tightly compressed synclinal range, 600 to 900-m. high, and runs as such for at least 100 km. before dividing up into a number of parallel folds. Several plateaus are enclosed between parallel, flat-topped ridges of which the Bhorat plateau between Kūmbhalgarh and Gogūnda, with an average elevation of 900 m., is the highest. Farther south, the Arāvalli again spreads out in a fan-like form; the eastern part consists of pronounced strike ridges rising to another 300 m. and the western part is a jumbled mass of hills and ridges of still higher elevation. Guru Sikhar (1,722 m.) on the Abu hills is the highest peak of the Arāvalli, and Abu (1,158 m.) the only hill-station in Rājasthān. The Abu hills and the surrounding country are composed of granites and the topography consists of wavy rounded hills, quite different from the flat-topped Arāvalli range.

The portion of Rājasthān lying east of the Arāvalli range forms an upland ranging in height from 250 to 500 m. It is drained mainly by the Banās and many of its tributaries. The Banās rises from the eastern flank of East Rājasthān upland the Arāvalli near Kūmbhalgarh, flows for 400 km. and joins the Chambal at Rāmeswar. Its deep gorges across north-south trending the Toda and Ranthambhor hills look splendid. The Chambal enters the Rājasthān State The Chambal near the northern end of the Gāndhi Sāgar and flows for 360 km. in Rājasthān through a deep gorge to the south of Kota and an open valley near its confluence with the Kāli Sindh, Pārbati and Banās. Farther down, its course lies beneath overhanging cliffs between Mandrael and Dholpur, and from that point its banks begin to be dissected into ravines.

East of the Chambal, the Madhya Bhārat Pathār area has a rocky surface and dense forests. Near the Gwalior town the scarped face of sandstone rocks is characteristic. Farther north in the

Lashkar area, plains topography prevails; it continues northwards until the ravines of the Chambal and the Kunwari are reached.

The main river of this upland is the Chambal which Madhya Bhārat traverses the whole length in a southwest-northeast Pathār direction with the banks of its lower reaches dissected into ravines. Wherever there is an alluvial covering, as in the west of Shīvpuri and south of the Chambal between Sabalgarh and Mahārājpur, the country-side has a more pleasant look and has invariably a large concentration of population.

Another section comprises all that part of Bundelkhand which lies between the Yamuna and the northern arcuate scarp of the Vindhyan plateau. It presents an old erosion surface, carved out of granite, known in Indian geology Bundelkhand upland as Bundelkhand gneiss. The regional slope is to the north-east, and it falls in broad steps from the foot of the Vindhyan scarp to the Yamuna river. Three surfaces with an average elevation of 100 m., 150 m. and 300 m. cover practically the whole of the region, though individual mesas and buttes rise here and there above the general level. The northern alluvial plains merge imperceptibly into granitic uplands. Then the landscape changes. Buttes of granite and sandstone, artificial lakes, and long narrow serrated ridges of quartz reefs and trap dykes diversify the topography. One of the oldest shore lines of India is to be seen near the point where the granitic plain surface abuts against the Bijāwar hills on the south of Chhatarpur.

To the north of the Vindhya range occurs this extensive lava plateau in Madhya Pradesh with a general northward slope, good drainage and black soil. Once heavily forested, it Mālwa plateau is now dotted with towns and villages. There are rolling plains, separated by flat-topped forested hill ranges and drained by a number of north-flowing rivers, the Betwa, Pārbati, Newāj, Kāli Sindh, Chambal and Mahi. It is the interfluve areas that are more open and contain most of the towns and villages. Bhopāl, capital of Madhya Pradesh, lies between the Betwa and the Pārbati.

South of the Bundelkhand uplands a group of plateaus rise abruptly. They are principally composed of fluvio-marine deposits from an arid or subarid region in a remote geological time, perhaps Cambrian, and became uplifted Vindhyan scarplands and peneplaned several times since then. A feature which distinguishes this region today is its remarkable erosional scarps trending east-west. Its structure in its simplest form is that of a flat-topped syncline, and its present-day topography is clearly related to the structure and lithology. The strong sandstones of

the Kaimur, Rewa and Bhander series of the Vindhyan system are the principal scarp makers and also form the surface of the three constituent plateaus descending in steps from west to east. All the three plateaus are limited in the south by a great escarpment, locally known as the Kaimur hills ; and in the north similar scarps, though notched by north-flowing streams and much reduced in elevation, separate them from the adjacent lowlands. Another series of transverse scarps trend north-south and separate more or less sharply one plateau from the other. Nearer these scarps the plateau surface is considerably dissected. This is most noticeable in the Bhander plateau. Streams flowing over the northern scarps of the Rewa plateau have formed rapids or waterfalls and the largest of them, the Tons, has formed a wide gap separating the Vindhya-chal from its eastern counterpart, the Mirzapur hills. The Kaimur plateau appears to be tilted slightly northwards and its southern slope facing the Son valley is marked by scarps and terraces, the former being developed on sandstones and limestones, and the latter on quartzites. The Son flows through a strike valley and part of its southern bank is extremely jagged because of the peculiar weathering of porcellanites (metamorphosed tuffs). Another interesting feature of the Son is that all its important tributaries, the Banas, Gopad, Rihand, Kanhar and North Koel, come from the south. The drainage in the west is out of harmony with the topography as both the Betwa and Ken rivers maintain their northerly courses across the higher Vindhyan hills. These are obviously superposed rivers, originating on a much younger trappean surface, the outliers of which are scattered among Vindhyan rocks.

The Vindhya range is really an escarpment which varies in character and height, depending on the structure and lithology

of the underlying rocks. For the first 100 km. from  
The Vindhya range its western terminus, Gomānpur peak (554 m.) in the  
Dhār District of Madhya Pradesh, the Vindhya range runs in a curve, its convex side facing the Narmada valley and following a 300-m. contour line. There the country rock is basalt of the Deccan Trap ; on weathering it has given rise to a belt of hilly country, 10 to 20-km. wide, heavily forested and sparsely populated. For the next 160 km. a more open type of country prevails and the escarpment, still built of basalt, becomes more prominent. Streams form beautiful waterfalls, especially to the north of Udaianagar. Near Hoshangābād the rock type changes ; the Vindhya mountain comes down very close to the Narmada river and presents a terraced slope built of hard sandstones alternating with shales. A good panorama of the true Vindhyan landscape with

its bold escarpment overlying terraced slopes can be seen from Ginnurgarh fort which stands on a sandstone platform at a height of 600 m. The Kaimur range, that is the eastern portion of the Vindhya mountain, is the most pronounced scarp of India, developed on sandstones and limestones, and is nowhere breached by any large stream and is not even notched by any prominent wind gap. The terraces below the scarp are carved out of quartzites and glauconites.

The Narmada valley is exceptional in the sense that unlike the other river valleys of India it has not been carved by the river

The Narmada valley itself which flows through a structural depression. It is probably a subsided land-mass between the

Vindhya range on the north and the Sātpura on the south, and appears to be an asymmetrical valley sloping westwards contrary to the direction of the flow of all the other rivers of Peninsular India except the Tāpti and the Indrāvati.

The Narmada rises on the Amarkantak plateau from a spring at an elevation of about 1,057 m. and soon descends 150 m. over

The Narmada a precipitous basaltic cliff, and then begins to meander as far as Mandla. From Mandla town the river turns north towards Jabalpur forming rapids through

a rock bed, and at Bherāghāt it forms a magnificent waterfall 15-m. high, the Dhuāndhāra (Fall of Mist). This is also known by the name Marble Falls, as the bed-rock here is marble. Below the waterfall there is a gorge 3-km. long. Emerging from the gorge the Narmada flows west through fertile, alluvial plains for 350 km. between Jabalpur and Handia with an average width of 50 km. to the south of the river. Below Handia the hills again approach the river on both sides and are clothed with dense forests. Emerging again from the hills beyond Mandhāta, the Narmada enters a second open alluvial basin, 150-km. long, the Mandleshwar plain. The hills are here well away from the river. Once more the Narmada enters a gorge carved out of basaltic hills, 150-km. long. Emerging from the Rājpīpla hills, it meanders in broad curves for 80 km. till it reaches Broach. Then the valley widens into an estuary, 25-km. long. Finally the river enters the Gulf of Cambay.

#### *Peninsular Plateaus*

The Peninsular plateaus constitute the largest physiographic division, facing the Bay of Bengal in the east and the Arabian Sea in the west. Its maximum length from Pachmarhi on the north

to Cape Comorin on the south is 1,600 km. and the maximum width from the Sahyādri on the west to the Rājmahāl hills on the east is 1,400 km. The plateau surface rises to over 1,000 m. in the south, but hardly exceeds 500 m. in the north. It is triangular in shape with its apex near Broach and its base extending from the southernmost point of India to Rājmahāl in Bihār along the Eastern Ghāts. The two other sides of the triangle run along the Sahyādri and the Sātpura range. The Peninsular plateaus consist of five distinctive physiographic subdivisions: Western hills, North Deccan plateau, South Deccan plateau, Eastern plateaus, and Eastern hills.

The Western hills cover all the three sections of the Sahyādri—northern, central and southern. The Sahyādri is composed of at least two different types of rocks of varying hardness Sahyādri (Western Ghāts) on the basis of which the range can be divided into two sections. The northern 640 km. of the Sahyādri is built of horizontal sheets of lava. These have given rise to the typical Deccan Trap landscape. Viewed from the east, the range seems cut up into terraces, but from the west coastal plain it looks like a sheer wall. The crest line runs in broad curves, forming two re-entrants at Trimbak and Tamhini, carved by the head-waters of the Godāvari and Bhima rivers respectively, and two easterly bulges marked by Harishchandragarh (1,424 m.) and Mahābaleshwar peaks (1,438 m.). Two other peaks rise higher, Kal-sūbai (1,646 m.) near Igatpuri and Sālher (1,567 m.) 90 km. to the north of Nāsik. Thalghāt and Bhorghāt are the important passes through which roads and railways run between the Deccan plateau and the Konkan plains.

For the next 640 km. from the 16° parallel of latitude N. to the Nilgiri mountain, the granitoid gneiss takes the place of basalt and the country-side has a different aspect. The Sahyādri in this section runs very close to the coast and at several places comes down to the sea-shore, finally joining the Nilgiri mountain near Gūdalūr. Vavul Mala (2,339 m.) is the highest peak. Because of the rugged terrain and dense vegetation, human settlements are rare. Yet the Sahyādri helps the growth of population in adjoining regions by allowing its perennial rivers to discharge their waters lower down and to form large storage reservoirs in the hills for irrigation and generation of power. The latest addition is the Koyna lake which receives waters from the catchment area of the Koyna river, a tributary of the Krishna.

All the important rivers of the Deccan have their sources on the Sahyādri. Next to the Ganga, the Godāvari is the most sacred river of India. It rises near Trimbak in the Nāsik District and

flows through a deep 20 km. gorge over the Sahyādri before reaching Nāsik town. The Bhīma, the most important affluent of the Krishna, rises at Bhimashankar in the Sahyādri, about 100 km. south of the source of the Godāvari. It also flows through a deep valley in its passage through the hills. To the south of the Bhima rises the Krishna river near Mahābaleshwar hill-station, and receives one of its head-waters, the Koyna, at Karād and another, the Ghātprabha, noted for its waterfall, at Gokāk. Farther south rises the Tungabhadra, the most important tributary of the Krishna. It is formed by the union of the Tunga and Bhadra, both rising near Gangāmūla peak (1,199 m.), about 25 km. south-west of Sringeri. The Cauvery, known as Dakshina Ganga (Ganga of the South), has its source on the Brahmagiri hill in the Coorg District of Mysore State. All these rivers flow eastwards into the Bay of Bengal, though their sources are nearer the Arabian Sea. Of the west-flowing rivers, the Sharāvati deserves mention; it has been dammed in the hills to create a vast lake and forms beautiful waterfalls near Gersoppa on the west of the crest.

The Pālghāt Gap, trending east-west, marks a prominent break in the continuity of the range along the western border of the Deccan plateau. It is about 24-km. wide at its narrowest point and lies at an elevation of 144 m., whereas the bordering ranges rise from 1,500 to 2,000 m. The Ponnāni river, which flows through it westwards, is utterly incapable of carving out this depression, which in all probability is a rift valley owing its existence to subsidence of the land between two parallel fault lines. It is mainly due to this gap that the densely populated coastal plains of Kerala can be linked with the rest of the Deccan by roads and railways, and moisture-bearing clouds of the south-west monsoon can penetrate to some distance inland, bringing rain to the parched plains of Mysore.

Beyond the Pālghāt Gap the Sahyādri again continues southwards. It has different names in different parts, but is collectively known as the Southern Ghāts. Anai Mudi, the highest peak (2,695 m.), is a nodal point from which three ranges radiate in three different directions: the Anaimalai in the north; the Palni in the north-east; and the Cardamom hills or the Elamalai in the south. The Anaimalai descends into a series of terraces to about 1,000 m. and the lower terraces are clothed with magnificent teak forests. Kodaikānal, an important hill-station, is located in the Palni hills. The Elamalai has a number of cardamom plantations, and is

South Sahyādri  
(the Southern  
Ghāts)

locally known as the Cardamom hills. It faces on the east one of the most densely populated valleys in South India, the Kambam valley. The Periyār rises near Devar Malai (1,922 m.) and flows westwards into the Arabian Sea. It has been dammed in the upper reaches and a large lake has been constructed; around this there is a wild game sanctuary. The waters of the Periyār lake are tunnelled through the mountains into the Suruli river of the Kambam valley. Here, ridges alternate with valleys, the west Vaigai hill, the Vaigai valley and the Varushanād-Āndippatti ridge being typical examples. The Vaigai flows for about 90 km. within the hills and takes over the Periyār waters from the Suruli at Allinagaram. The inaccessibility of the southern portion of the Southern Ghāts has made it very sparsely populated, and it is here that one may come across the cave-dwellers of India. The influence of relief on natural vegetation is well marked. Stunted trees clothe the foot-hills which give place to open forests of a deciduous type at an altitude of 300 m.; this again changes to evergreen forest of broad-leaved trees from the 1,000-m. level. The impenetrable jungle has now been cleared in the more accessible parts of the Southern Ghāts and plantation crops—rubber, coffee and tea—have been introduced. The Tāmbraparni is the most important perennial river in this region. It rises near Agastya Malai and forms a series of waterfalls before descending to the plains at Pāpanāsam in the Tirunelveli District of Madras. The falls at Bānatīrtham and five others at Pāpanāsam are particularly notable.

The Sahyādri at its northern end almost touches the east-west trending Sātpura range, and descends eastwards to a typical Deccan country, the northern part of which is built up principally of plateau lava. North Deccan comprises two distinctive physiographical provinces: the Sātpura range and the Mahārāshtra plateau.

Three distinct parts of the Sātpura are easily discernible from west to east, rising almost to the same height of 900 m. and are connected with each other by lowlying plateaus. The Sātpura range The westernmost part still retains the name Sātpura, though locally the name of Rājpīpla hills is given to the western section. A high, craggy, sharp-crested ridge formed of basalt dominates this western part of the Sātpura and almost overhangs the Narmada valley between the two north-flowing tributaries of the Narmada: the Devganga and Goi. The Sātpura broadens considerably in the central part and has a radial drainage. This part is bordered on the north by the Mahādeo hills and on the south by the Gāwilgarh hills. The former

consists of strong sandstones of the Gondwāna age and slopes gently northwards but steeply southwards, the southern slope falling abruptly from a height of 1,200 to below 300 m. and the cliffs running E.N.E. for a long stretch. The highest peak of the Sātpura, Dhūpgarh (1,350 m.), is near Pachmarhi hill-station. Even if there is no clear evidence of faulting, the rectilinear trend of the scarp indicates that faulting was partly responsible for the steep scarp.

The eastern part of the Sātpura is known as the Maikala plateau. It is bordered on the east by a line of eastward facing escarpment, the Maikala range. This range runs in a north-eastern direction from Rāj Nāndgaon to the Amarkantak knot and then turns north-west, meeting the Vindhya range to the north of Jabalpur. It appears that the Maikala range proper marks the site of an ancient shore line to the east of which sediments were deposited in the ancient Cuddapah Sea, and that it may have prevented the flow of lava further east during the Deccan Trap period.

Nearly the whole of the Mahārāshtra plateau is formed of plateau basalt, which on weathering has given rise to rolling plains with intervening shallow valleys. The ground rises westwards where the hills are capped with younger trap flows, and still farther west younger flows have given rise to high and bold hills. Flanking each of the three river valleys of the Godāvari, Bhīma and Krishna, there are flat-topped but steep-sided low hills. Only the upper reaches of these three rivers lie in this region, but hundreds of smaller perennial streams fed by excessive rainfall in the Sahyādri flow through this area and make it agriculturally productive.

The west-flowing Tāpti (Tāpi) forms the northern boundary of this region. It rises from a spring near Multai on the Sātpura range, flows for the first 110 km. through a rocky steep-sided valley and opens up near Burhānpur.

Lower down it receives its principal affluent, the Pūrṇa, coming from the east through the cotton-growing plains of Berār. It is this territory that forms the north-eastern boundary of the Mahārāshtra plateau. From the confluence the Tāpti flows westwards for another 210 km. through an alluvium-filled open valley which is very densely populated in this stretch. Then it enters a hilly country. Emerging out of the hills at Māndvi, the river meanders for another 50 km. through alluvial plains until it reaches the Arabian Sea west of Surat. South of the Tāpti rises the Ajanta range with its famous caves. A southern spur, the Ellora hills, is equally famous for its caves.

The Mahārāsh-  
tra plateau

Farther south is the Godāvari. It enters the Mahārāshtra plateau at Nāsik and flows for 650 km. eastwards to the farthest end of this region, receiving on its right bank the The Godāvari Pravara and Sindphana rivers and on its left bank the combined waters of the Dūdna and Pūrna. The river then enters the Telangāna plateau and receives its first tributary, the Mānjra, which flows northwards near the boundary between Mahārāshtra and Andhra Pradesh. The Godāvari continues to flow eastwards through gneissic country for 50 km. before it turns south and receives its principal tributaries, the Prānhita and the Indrāvati. In its southern course for the next 25 km. it traverses a Gondwāna coal basin. The river then changes its course again, cuts through the Eastern Ghāts in a gorge and flows through its own delta, eventually reaching the Bay of Bengal.

Unlike the Mahārāshtra plateau, the plateaus of Andhra Pradesh and Mysore State are carved out of Archaean gneissic South Deccan : rocks. The Godāvari divides the Telangāna plateau into two sections. The northern section is bounded plateau on the north by the east-flowing Wardha and on the east by the south-flowing Prānhita, a tributary of the Godāvari. This region is very hilly and forested and contains few inhabitants. In the southern section the rolling surface and gneissic rocks created favourable conditions for the building of a large number of irrigation tanks, and these usually mark the sites of settlements. The surface of the plateau is dotted with low hills and shallow depressions. One such depression, surrounded by low hills, 130-m. high, provided the site for the twin city of Hyderābād-Secunderābād, capital of Andhra Pradesh.

On the basis of altitude the Karnātaka plateau has been divided into two sections. The 600-m. contour line may be taken as the dividing line between the northern section and the The Karnātaka Mysore plateau. The Krishna and the Tungabhadra plateau flow through the northern section. The Krishna changes its course from south to east on entering this plateau and flows for 400 km. before entering the Telangāna plateau. Here it receives two important tributaries on its right bank, the Ghātprabha and the Malprabha and flows in braided channels through high banks of laterites, entering a gorge at Jaldurg, and soon after it leaves the North Deccan plateau over a succession of low granitic scarps. Farther east of the Telangāna plateau, its bed becomes rocky, and the channel is directed more and more northwards by a continuation of the Nallamala range. A great dam, Nāgārjuna Sāgar, has been constructed here for irrigating vast stretches of arable land. Near Jaggayyapeta

the river turns sharply to the south, cuts through the range and enters its delta at Vijayawāda. The total length of the Krishna from its source to its mouth is about 1,280 km.

The Mysore plateau is the loftiest and most well-defined plateau of South India. The regional slope is to the east, but the northern portion has developed a northerly slope. This plateau abuts against the Sahyādri on the west and is bounded on the east by the Eastern Ghāts. Along its southern boundary rises the Nilgiri. Physiographically, the Mysore plateau may be divided into two sections, Malnād and Maidān. The Malnād portion is the hilly area, bordering the Sahyādri, and has an average width of 35 km. and a mean elevation of 1,000 m. It is dissected into steep hills and deep valleys and covered with dense forests. The Maidān is an area of rolling plains with low granitic hills.

The Cauvery is the master stream here. Its first reach between Brahmagiri and Kushālnagar is outside the limit of the

Mysore plateau. There the river flows through an incised, meandering valley—high banks with dense vegetation. On entering the Mysore plateau it flows eastwards in a succession of rapids and waterfalls; the most picturesque of them is Chunchan-katte. The river then widens and forms the first island, Seringapatam. Near Mysore city the artificial lake, Krishnarāja Sāgara, has been constructed by damming the Cauvery. Sivasamudram island is enclosed by the Cauvery Falls: the Gagana Chukki and the Bhar Chukki, somewhat resembling the Niagara. The river then enters the Madras plains and finally reaches the Bay of Bengal through two distributaries flanking Srīrangam island. The total length of the Cauvery from its source to its mouth is 760 km.; of this 200 km. lie in the Mysore plateau.

With the disappearance of lava in the east the plateau character changes and hills and basins diversify the landscape. This part of the Peninsular plateaus consists of the Baghelkhand plateau, Chota Nāgpur plateau, Mahānadi basin and Dandakāranya.

East of the Maikala plateau and north of the Mahānadi basin lies the Baghelkhand plateau. It is bordered on the north by the Son river, which rises from Sonbhadra near the source of the Narmada and falls in a cascade over the scarp of the Amarkantak highland. The river then flows for 500 km. in the hilly country and another 150 km. in the Ganga plains before it joins the Ganga near Patna. The Son flows through a strike valley parallel to the Kaimur scarp which overlooks it on the north, and receives most of its tributaries from the south. The Gopad, a tributary of the Son, flows obliquely

across the strike of the Sonpār hills and must be older than the hills through which it flows.

The trends of several other rivers, especially the Banās, appear to be least influenced by the strike of hill ranges. The Rihand, another tributary, has been dammed and the reservoir thus created is the largest of its kind in India. The area south of the Son comprises anticlinal hills and synclinal valleys carved out of sandstones and limestones of the Semri series and designated as Sonpār hills. These hills are perhaps remnants of an ancient mountain of the type of the Arāvalli, which existed in the earlier part of the Vindhyan times and had an east-west trend parallel to the Son. The trellis drainage pattern in the folded rocks is another distinguishing feature of this region. The topography is further diversified by flat granitic plateaus to the east of the Gopad, with broad undulations and basins of the Gondwāna age in the south. The Singrauli basin, formed of Lower Gondwāna rocks, is considerably dissected.

The largest and most typical part of Chota Nāgpur is the Rānchi plateau, which is developed on granite-gneiss. The average elevation of its upper part is 700 m. Rounded hills of massive granite (monadnock type) and slightly elevated terraces of older flood plains mark the topography of the Rānchi plateau. Apart from these low hills, the horizon is quite flat and one can safely presume that the Rānchi plateau is a peneplain. All the important streams including the South Koel and Subarnarekha have their source near Rānchi town and radiate in all directions, uninfluenced by the present relief. The Rānchi plateau is deeply dissected around its edges, giving rise to steep escarpments, locally known as *ghāts*. A number of waterfalls including the Hundru mark the breaks in the thalwegs of the Subarnarekha and other streams crossing these scarps. Of the hills bordering the Rānchi plateau on the south, the Porāhāt and the Dalma range are most conspicuous. Both are lava hills—the latter has a synclinal structure. The Subarnarekha antedates the present Dalma range as it cuts through it to the north-west of Jamshedpur, exposing mica schists in its bed and lavas on its upper slopes.

The Dāmodar flows to the north of the Rānchi plateau in a faulted trough containing a number of Gondwāna coal basins.

The three newly constructed reservoirs in the Dāmodar valley, Konār, Pānchet and Maithon, provide water for power generation, irrigation and navigation.

North of the Rānchi plateau occurs a group of plateaus and hills, including Hazāribāgh plateau and Kodarma plateau, representing peneplains at various stages of uplift and dissection. They are flat except in the outward edges. This is due to the massive character of the country rock, granite-gneiss. North-east of the Kodarma plateau, bold short quartzitic ridges alternate with valleys carved out of softer schists, giving rise to a modified Appalachian structure. Another group of uplands in the eastern part represents the less elevated portions of this physiographic region. Two reservoirs have recently been constructed in this region by damming the Barākar (Tilaiya) and Mayūrākshi (Masānjor) for multipurpose projects. A group of higher plateaus, the Netarhāt and Jashpur Pāts, overlook the Rānchi plateau on the west. They have flat laterite-capped summits known as *pāts*, which rise to over 1,000 m. and present steep scarps around their edges. These mesa-like plateaus are just remnants of an older and more extensive peneplain, largely destroyed in later cycles. They enclose a number of picturesque flat-floored basins, oval in shape, such as the Chhechhāri basin.

The Rājmahāl hills mark the end of the Chota Nāgpur plateau on the north-east. These hills, capped by lava-flows of the Jurassic age, are flanked on the west by Gondwāna sediments. **Rājmahāl hills** Before the start of volcanic activities, the Archaean terrain was base-levelled. A subsequent uplift with eastward tilt gave rise to the present mesa-like appearance and then erosion produced typical scarps on the northern edge.

The other important river that rises from the Central Highlands is the Mahānadi, which flows through a perfect geographical and geological basin, 300-m. high, surrounded on **The Mahānadi** all sides by hills rising from 600 to 1,000 m. From near the source of the Narmada on the Amarkantak plateau rises the Arpa, tributary of the Seonāth, the principal affluent of the Mahānadi. The parent stream rises from the northern edge of the Dandakāranya and joins the Seonāth, a little to the west of Sheorīnārāyan; then the combined streams flow due east for 160 km. as far as Sambalpur, receiving the Hasdo and the Mānd from the north. The river has been dammed at Hirākūd above Sambalpur and its water, spread over 750 sq. km. is being utilized for irrigation and generation of power. Beyond Sambalpur the river turns first southwards and then eastwards through a 65-km. long gorge across the Eastern Ghāts. Emerging from the hills it has built up a delta. The total length of the course of the Mahānadi from its source to its mouth is 900 km. The central part of the Mahānadi basin is named after Chhattīsgarh. The

floor of the Chhattīsgarh basin is composed of horizontally bedded or very low-dipping limestones and shales of the Cuddapah age, concealed under a capping of alluvial clays and residual soils.

The tract known as Dandakāranya occupies a very sparsely populated and rugged terrain south of the Chhattīsgarh basin in three Districts—Bastar, Kālāhandi and Koraput. It Dandakāranya is being developed for rehabilitating displaced persons, especially around Parasgaon and Umarkot. The Indrāvati flows in the middle of this region from east to west across three broad terraces. The highest, Koraput plateau, is about 1,200 m. above sea level. The second terrace is well developed around Jagdalpur town, extending westwards to Chitrakot, where the river leaps over a precipitous cliff, forming one of the most famous waterfalls in Peninsular India. Below the falls the river enters the third terrace, considerably dissected, finally joining the Godāvari near Bhopālpatnam. The lowlying part of Dandakāranya lies in the north. The western portion consists of deep valleys and short spurs without any definite orientation. The southern part is drained by the south-flowing Sābari which rises from the western slope of the Eastern Ghāts and flows through deeply dissected hills.

The Garhjāt hills in Orissa extend from the southern border of the Rānchi plateau almost to the Mahānadi river in the south. In absolute elevation the greater part of this region is much lower than the Rānchi plateau, but local relief is very much pronounced. The country is wild, densely forested and sparsely populated. The Bonai hills, the Keonjhar plateau and the Simlipāl massif are relicts of the oldest land-mass of India of the Dhārwār age. They were repeatedly uplifted into mountains and eroded into peneplains, the evidence of which is found in the flat summits at elevation ranging from 400 to 1,000 m. The entrenched meanders of the Baitarani suggest rejuvenation of the valley in recent times. Two other rivers, the Sankh and the Koel, unite in the Gāngpur faulted basin. The Sankh provides water to the Rourkela Steel Plant through the Mandira reservoir.

The Dandakāranya abuts against a mountainous tract on the east representing the northern portion of the Eastern Ghāts, which lie in Orissa and Andhra Pradesh, covering 75,000 sq. km. with an average width of 100 km. in the south and 200 km. in the north. Nowhere do the Eastern Ghāts exhibit their true mountain character so clearly as between the Godāvari and the Mahānadi. The ancient name of the Eastern Ghāts, Mahendragiri was given after

The Eastern  
Ghāts (northern  
section)

a peak of that name (1,501 m.) which stands conspicuously above the coastal plain, about 80 km. south-west of Berhampur in the Ganjam District of Orissa. This mountainous tract, principally composed of khondalites and charnockites, is locally known as *Māliyās* (highlands). The general trend of the ranges is from north-east to south-west, forming a watershed between west-flowing streams like the Machkund and Sileru, and east-flowing streams like the Languliya and Vamsadhāra. The Machkund has been dammed and an artificial lake generates hydro-electric power.

The Eastern Ghāts in the Deccan proper do not constitute a continuous range. They occur mostly as detached low hills developing range characters only in the Cuddapah

The Eastern Ghāts (southern section) and Kurnool Districts of Andhra Pradesh. The Biligiri Rangan hills near its southern end is a well-defined range, its slopes clothed with teak and sandalwood forests. A beautiful temple stands on its grassy top (1,750 m.). Farther north the Cauvery cuts the range transversely, forms the Hogenakal waterfalls, and provides water for the Mettur reservoir constructed a little lower down. Another well-defined range, Melāgiri, noted for sandalwood and other valuable timber, stretches north-east from the northern bank of the Cauvery, its highest peak rising to 1,395 m. To the east of the Eastern Ghāts rise two other groups of hills; the southern group is dominated by the Shevaroy hills, the northern by the Javādi hills. Composed of charnockite rocks, they are extremely dissected and very sparsely populated.

Farther north occur north-south trending parallel ranges and valleys of the Eastern Ghāts, cut transversely by the Penner river in the south and the Krishna in the north. It is here that the true mountain character of the Eastern Ghāts is well revealed. The most prominent range of this section, the Nallamala, runs parallel to the Coromandel Coast and changes its strike northwards along with the change in the direction of the coastline. Its southern part, the Pālkonda range, is higher. From the tip of the northernmost point in the Palnād basin to the Tirupati hill on the south, the length of the Nallamala is 430 km. the average width 30 km. and the elevation ranges from 900 to 1,100 m. It is composed of quartzites and slates, considerably disturbed from their horizontal disposition. To the west of the Nallamala runs the wide Nandyāl valley, carved out of soft shales and shaly limestone. In strong contrast with the rugged Nallamala hills where only a few tribal people live, the Nandyāl valley is densely populated.

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The most picturesque and habitable mountain with temperate climate in the tropical part of India is the Nilgiri or Blue mountain.

The Nilgiri Its northeast-southwest trend conforms to the trend of the Eastern Ghāts. The Nilgiri is the meeting ground of three mountain systems of Peninsular India, the Sahyādri joining it opposite Makurti peak, the Southern Ghāts across the Pālghāt Gap in the south, and the Eastern Ghāts in the north-eastern corner. The abrupt rise of the Nilgiri from the surrounding area is very striking. This rise may be attributed to strong charnockites which compose the mountain and later subsidence of the peripheral parts along fault lines. Two of the highest peaks are Doda Betta (2,637 m.) and Makurti (2,554 m.). The south-western part, named Kunda, is more hilly and is traversed by bold ranges and intersected by deep valleys. It has a steep cliff towards the Malabār plains on the west. There is perhaps no landscape in South India that surpasses this gigantic escarpment in grandeur. The rest of the Nilgiri presents a different topography. Its surface is extremely undulating and the streams meander through rounded grassy hills and patches of forest called *sholas*. Ootacamund, the most popular hill-station in South India, is located in a broad undulating valley at the foot of Doda Betta.

A fairly wide belt of hilly country lies at the foot of the Eastern Ghāts in Madras State. It is here that one can find typical examples of pediplains in India. All the east-flowing rivers from the Vaigai in the south to the Pālār in the north have to cross this upland before entering into the East Coastal plains.

### *East and West Coasts*

The coastal plains of India are washed by the Bay of Bengal on the east and the Arabian Sea on the west, the Indian Ocean touching the southern toe. The East Coast plains are much wider and drier than the west. A number of deltas also occur on the East Coast, but none on the west. The West Coast, on the other hand, includes two peninsulas, Kāthiāwār and Kutch, and one vast extensive plain, Gujarāt. The western coastline runs more or less straight, from Cape Comorin to the 22° parallel N.; whereas the coastline in the east runs in wide curves, changing direction from north to north-east from the 16° parallel. Unlike the West Coast, the East Coast is deficient in rainfall and contains shifting sand-dunes and stretches of saline soil.

### *East Coast*

In Madras and Andhra Pradesh the East Coast is called Pāyān Ghāt. It extends from Cape Comorin northwards to the united deltas of the Krishna and Godāvari for 1,100 km. with an average width of 100 to 130 km. Farther north, the hills come down almost to the coast. The coastal plains again widen to the north of Berhampur and extend to the Chilka lake, the delta of the Mahānadi, and the Bālasore coastal plain, where they merge into the Ganga deltaic plains. There are a number of lagoons and backwaters, some of which are linked up by the Buckingham Canal. The Pulicat lake near Madras is a typical lagoon which existed at various levels in the past and is now separated from the sea by the Sriharikota island, an old beach ridge. The seaward fringe of the coast is in general swampy and sandy, and that makes it uninhabitable. This physiographic region has been divided into two units : East Coastal plain and East Continental shelf. From north to south, the coastal plains have been designated Utkal, Andhra and Tamilnād plains.

The coastal plains in Orissa, called Utkal plains, extend for 400 km. from a little north of the Subarnarekha river to a little south of the Rushikulya river. They include the

The Utkal plains Mahānadi delta with Cuttack at its head. It differs somewhat from the Ganga delta; its form along the seaward margin is more straight and is fringed with sand-dunes because of stronger wave action. The forest-covered, marshy

The Mahānadi delta terrain along the coast is much less conspicuous than the Sundarbans of the Ganga delta. Like any other delta-building river, the Mahānadi has a number of distributaries; the Kātjuri is the largest.

South of the Mahānadi delta, the most important physiographic unit is the Chilka lake. Its origin is due to the formation of a bay-mouth bar, in places little more than 200-m. wide. The lake, as it spreads out into a pear-shaped expanse of water, 70-km. long, widens in the north-east and tapers in the south-west. Two rivers, the Bhārgavi and Daya, drain into the lake, making the water sweet in the rainy season. Hills bound the shores on the south and west. There are a number of rocky islands. South of the Chilka, the coastal plain is dotted with low hills and is drained by the Rushikulya river.

The Andhra plains stretch from the southern limit of the Utkal plains to the Pulicat lake, 50 km. north of Madras city.

Their elevation near the coast ranges from 5 to 50 m. Two of the biggest rivers of the Deccan, the Godāvari and Krishna, flow through this region and form deltas in their lower reaches. Between the two deltas is the Kolleru lake, near Eluru town. It receives the drainage from adjoining hills and is connected with the sea by a single channel. The present lie of this lake is taken as evidence of the advance of the coastal plain towards the sea.

The Godāvari emerges into the plains out of a gorge at Polavaram. It soon divides into two distributaries, the Gautami Godāvari and the Vasishta Godāvari. The main delta lies between these two rivers and is traversed by seven distributaries of the Godāvari. Dowlaiswaram is the site of an anicut across the river.

Emerging from a deep gorge carved out of gneissic hills, the Krishna strikes the coastal plains at Vijayawāda and flows for 90 km. before it reaches the sea. It does not have as many distributaries as the Godāvari. The bulk of the waters of the river flows through one channel until, close to the sea, it splits into three channels. An anicut at Vijayawāda divides the river into a network of canals serving the whole delta.

The rest of the East Coast comprises the Tamilnād plains, 675 km. in length and with an average width of 100 km. The Cauvery delta is its most important physiographic unit. The river divides into two channels at the island of Srīrangam. The northern, Coleroon, serves mainly as a drainge channel. The southern channel feeds the canals which reach almost every part of the delta and make it the granary of South India. There is, however, a marshy area along the southern fringe of the delta to the east of Point Calimere.

Compared to the width of the continental shelf of the Arabian Sea, that of the Bay of Bengal is much narrower except on the north of the Gulf of Manaar and south of the mouths of the Ganga. In the former area two narrow necks of land, one coming from the Indian side and the other from Ceylon, are connected by a submerged reef, Adam's Bridge, hardly 4 metres below sea level. This is conclusive evidence of the rise of sea level since post-glacial times, which caused submergence of the connecting link between India and Ceylon.

In contrast, the shallow continental shelf south of the mouths of the Ganga is a plain of sedimentation, partly subaerial and partly marine in origin. A careful analysis of the results of

soundings in this part of the continental shelf reveals the presence of a submarine canyon which probably is the submerged portion of a former mighty river of Bengal, the Bhairab; the channels separating the sandbanks off the mainland represent the former tributaries of this river. The presence of a submerged valley system like that in the China seas may be postulated in this part of the Bay of Bengal.

### *West Coast*

The plains on the West Coast are confined to a narrow belt behind which rise the Sahyādri extending for 1,500 km. from Cape Comorin in the south to Surat in the north, the width ranging from 10 to 25 km. At the northern end are two peninsulas, Kutch and Kāthiāwār, which were once islands, and one vast plain extends to the farthest limit of Gujarāt. Farther south lie the coastal plains proper which have been subdivided into three areas, the Konkan coast, Karnātaka coast and Kerala coast, their limits conforming to the State boundaries. The West Coast plains athwart the rain-bearing south-west monsoon receive enough annual rain (200 to 400 cm.) for carrying out normal agricultural pursuits without irrigation. The West Coast plains are terraced in many places, especially between Trivandrum and Cochin. Some of the finest coastal lakes connected by canals are located here.

The Kutch peninsula had seas and lagoons on all sides. Until the silting up of the Great and Little Rann of Kutch which border the peninsula on the north and east, it was an island. The most striking physiographic features are sandy plains and bare rocky hills. For want of rain and flowing surface water, the work of the wind is felt everywhere, and this has given rise to arid and semi-arid landscape. The coasts are fringed with sand-dunes. Behind these, especially in the south, fertile and populated plains extend from east to west, parallel to the coast, with an average width of 50 km. The interior uplands consist of two principal east-west anticlinal sandstone ranges, the Chaduva and the Dhola, and a number of isolated buttes rising abruptly from the adjacent lowland.

All along the north of Kutch there stretches a broad level of salt-soaked plain. This is the Great Rann. Its southern continuation, now almost cut off from the Great Rann, is known as the Little Rann and lies on the east and south-east of Kutch. The Great Rann is about 320-km. long from Gujarāt mainland on the east towards the Indus

The Rann of  
Kutch, Great  
and Little

on the west, with a maximum width of 160 km. in the east, and covers about 21,500 sq. km. The flat unbroken surface of the Great Rann, composed of dark silt baked by the sun and blistered by saline incrustation, rises a few metres higher than sea level and is slightly depressed at three places. The surface is broken by patches of higher ground which rise like islands from the level barren plains of the Rann. Some of these are rocky, like the Pachham, Khadir and Bela, which have an anticlinal structure with the steeper face towards the north. Others are low, sandy and covered with grass, rising a few metres above the level of the Rann. The largest of the grassy patches, known as the Banni, lies south of Pachham island. It extends westwards along the mainland of Kutch for a length of 80 km. and a breadth of 24 km. and supports a scanty pastoral population. The Rann gets flooded every year partly by the Banās and the Lūni, partly by the smaller rivers of Kutch, and partly by the rise of sea-water.

South of Kutch lies the Kāthiāwār peninsula. It ends eastwards near the marshes of the Nal and on the other side begin the plains of Kāthiāwār. Two Ranns, the Little Rann of Kāthiāwār and the Rann of Cambay, along with the Nal lake nearly encircle the Kāthiāwār peninsula on the east and north-east. The 75-m. contour line may be taken as the boundary between the coastal plains and interior uplands. In general, the shores are very slightly raised above sea level. From the coast of Kāthiāwār rises a central tableland where all the rivers of the Peninsula have their source and flow in every direction. The northern part of the tableland is a rolling upland and the central part is dissected into a series of scarps. It is only in the southern part that there are some high hills, including the Girnār which rises to 1,117 m. and was long believed to be an old volcano. Farther south lies the Gir range with its dense forests. North-east of Porbandar, the Barda hills dominate the landscape. The Osam hill rises abruptly from the plains to the east of Porbandar. Most of these hills are volcanic in origin and are of cuesta type, the seaward slope being invariably steeper than the inland side.

East of Kāthiāwār stretch the plains of Gujarāt towards the interior highlands. Not only the coastal plains bordering the

The Gujarat plains Gulf of Cambay but the adjoining flood plains are also included in this province. Practically the whole of the Gujarat plains sloped westwards to the sea when an arm of the Arabian Sea extended from north of the head of the Gulf of Cambay to the Little Rann, separating the Kāthiāwār peninsula from the mainland. The regional slope is still to the west, and the greater part of the plains lies below the 150-m.

contour line, the altitude being 11 m. near the mouth of the Sābarmati river. The northern part of the plains is drained by the Banās and the Sarasvatī into the Little Rann of Kutch. Elsewhere the plains are drained by four larger rivers, the Sābarmati, Mahi, Narmada and Tāpti, into the Gulf of Cambay. The banks of the lower reaches of the Mahi are dissected into ravines. For the first 65 km. of its course, the river flows through a rocky bed and then spreads in a wide sandy bed for the next 15 km.; finally, in its lower reaches 70-km. long, the Mahi becomes tidal. Nearer the coast, wind-blown loess covers the greater part of the country, originally formed of older alluvium. Loess, on weathering, has given rise to a semi-arid type of landscape. Near the western limit of the Gujarāt plains occur a series of saline marshes which are subject to overflow at high tides.

The West Coastal plains become much narrower to the south of Gujarāt and assume typical coastal features. Their northernmost part, the Konkan coast, stretches from The Konkan  
coast north of Goa to Dāmān, a distance of 500 km. The coastline is in general cliffy. The submerged forests near the Bombay city suggest that the sea level rose on the Konkan coast in the past. Raised terraces either in the form of pure coral reefs or as impure incoherent calcareous rocks full of shells and corals, known as littoral concrete, occur in the esplanade of the Bombay city. The northern part of the Konkan coast is drained by the Vaitarna river, which rises close to the source of the Godāvari and flows westwards. It provided the earliest trade route between the sea and North Deccan. The lower reaches of the river around Agāshi Bay are densely populated. North of the Vaitarna river, the shores are flat and marshy near Dāhānu. The Ulhās is another important river, which rises from the north of the Bhorghāt, flows for 130 km. and enters into the Bassein Creek near Kalyān. South of the Bombay city, the rocky coast has a series of small bays and coves, shut in between jutting headlands and fringed with dazzling white sands.

The coastal plains of the Karnātaka stretch from north to south for 225 km. They are wider in the south than in the north.

The Karnātaka  
coast The Sharāvati, before entering the plains, descends down a cliff 275-m. high and forms the celebrated Gersoppa Falls. The coastline is sandy and rocky cliffs overhang the sea. The plains are nowhere more than 24-km. wide and are often only 8 km.

Generally speaking, the plains in Kerala are much wider and less hilly than the others. They extend from the north of Cannanore to Cape Comorin, a distance of 500 km. with an

average width of only 25 km. and ranging from 10 to 30 m. in elevation. The economy of this coastal plain is based predominantly on rice and cocoa-nut. The rivers in this section are short and many of them dry up in summer. A number of lakes or backwaters lie along the coast; some of them join the sea during the rainy season. The backwaters have been connected by canals and serve as waterways connecting Trivandrum with Tirür. The coastal lakes are better developed in the Quilon District. The Ashtamudi lake presents a lovely view. The Vembanād lake which stretches for more than 80 km. is also notable.

The forward edge of the Arabian Sea lies approximately where the depth of water is about 100 m. and its maximum width is about 350 km. off the coast of Bombay. The surface of the shelf here consists of two distinct terraces, separated by a 50-m. bathymetric contour, and its predominating rock appears to be the same trap which gives rise to terraced landscape on the bordering coast. One of the arguments supporting the seaward extension of the trap rock is its gradual increase in thickness from inland towards the West Coast. The submarine platform might well have been a part of the mainland before the former sea level fell by some 90 m. at the time of the pre-Flandrian marine regression. South of this wide submarine platform the continental shelf narrows down considerably, 30 to 100 km. and runs southwards throughout the seaboard as far as Cape Comorin. The evidence of submerged strand-lines is also provided by a number of banks on the continental shelf; of these, the Direction, Angria and Elikalpeni banks deserve mention. The lower levels suggest that there were still earlier marine regressions corresponding perhaps to the pre-Monastrian or pre-Tyrrenian age.

### *Bordering Seas and Islands*

The two Indian seas, the Arabian Sea and the Bay of Bengal, which encircle the coasts of India, came into existence during the late Cretaceous or early Tertiary times in the form of the northward prolongations of the Indian Ocean over the foundered portions of the ancient Gondwāna continent. The sea area can be divided into four zones in accordance with depths, limited by the bathymetric contours showing depths below sea level at 100, 1,000, 4,000 m. The zone 0 to 100 m. represents the major part of the continental shelf, which

extends seaward up to 200 m. The zone is about 350-km. wide south of Kāthiāwār, and 220-km. wide south of the mouth of the Ganga. Elsewhere, its width ranges from 50 km. on the East Coast to 100 km. on the West Coast.

India has a number of islands within her territory both in the Bay of Bengal and the Arabian Sea. Those in the Bay are much larger and more habitable. From the point of view of origin the Bay of Bengal islands differ Indian islands from those in the Arabian Sea; the former represent elevated portions of submarine mountains, while the other islands are entirely built of corals.

The principal islands in the Bay of Bengal have an arcuate trend from north-northeast to south-southeast, lying between  $6^{\circ}45'$  and  $14^{\circ}$  North latitude and  $92^{\circ}$  and  $94^{\circ}$  East longitude. There are two other islands outside this group. One is the Barren Island, about 140 km. north-east of Port Blair, and the other is the Narcondam Island, about 150 km. north-east of the Barren Island. These two islands are the only volcanoes within Indian territory. Both are extinct.

Three main islands, North, Middle and South, are collectively known as the Great Andaman. The Little Andaman is separated from the former by the Duncan Passage, and off these main islands lie numerous archipelagoes of smaller Andaman Islands islands. Some of these, like the Rutland and the Cinque Islands, have been detached from the main islands by wave action, and others like Ritchie's Archipelago are formed of newer rocks. The coasts of these islands are fringed with coral reefs. Large mangrove swamps occur in the northern part of the North Andaman between the Beele Bay and the Elizabeth Bay. The North Andaman Island is 80-km. long and has a maximum width of 20 km. The coastline is extremely indented and the coves and bays are much larger and more numerous on the east coast than on the west. The Middle Andaman is much wider and less indented. It is 70 km. long and 30 km. wide. Isolated hills rise 400 to 500 m. on the east coast. The coasts, both on the east and west, are cliffy and have very few bays. The South Andaman, on the other hand, consists of parallel ridges and valleys. The honeycomb weathering of sandstones which build up the ranges here is very conspicuous. The highest hill range, Mount Harriet, with peaks rising over 450 m., faces the east coast. The coast at its south is very much indented and here lies the main port of the Great Andaman, Port Blair. Off the west coast of the North and Middle Andamans, there are a number of smaller islands like Interview

and Anderson. These are composed of limestones which have weathered into sharp pinnacles.

There are nineteen islands in the Nicobar group, and only twelve of them are inhabited. The Great Nicobar is the largest, occupying 862 sq. km. The Car Nicobar is the northernmost island and most representative of this group. Lowlying, it is only 15 m. above sea level and has two hills which rise to 60 m. The entire island is encircled by fringing reef. The coasts on the west, south and east are flat and sandy. The south coast is in part swampy. Outcrops of rock occur on the northern coast and exhibit folded structure. The Little Nicobar, Katchall, Camorta, Trinkat, Nancowry, Teressa and Tillanchong are the other main islands of the Nicobar group.

The Barren Island is a dormant volcano. It erupted last in the early 19th century. The volcano consists of two crater walls. The outer, 3 km. in diameter, has been breached on the western side. The newer cone is symmetrical in shape and is composed of younger lava. There is a crater at the summit of the cone, 353 m. above sea level. The Narcondam, too, is an extinct volcano. Its crater wall has been completely destroyed.

The group of islands in the Arabian Sea stretches from  $8^{\circ}$  North latitude to  $12^{\circ}$  North latitude. Between  $11^{\circ}$  and  $12^{\circ}$  parallels occur the Amindivi Islands consisting of six main islands: Amini, Kiltān (Keltān), Chetlat, Kadmat, Bitra and Peremul Par. The Laccadive Islands proper extend between Nine and Eleven Degree Channels and comprise five major islands: Androth, Kalpeni, Kavaratti, Pitti and Suheli Par. There is a submarine connection between these two groups. Farther south occurs the Minicoy Island in the Eight Degree Channel. All these islands have been built up by corals and have fringing reefs very close to their shores.

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## CHAPTER II

### WEATHER AND CLIMATE

#### 1. *Introduction*

INDIA HAS A GREAT DIVERSITY of climates with many striking contrasts of meteorological conditions. The diversity is perhaps greater here than in any other area of similar size in the world. For instance, Assam in the east and Rājasthān in the west present extremes of dampness and dryness, a contrast sharper than that between England and Egypt. The contrast between Punjab in the north and Kerala in the south is equally pronounced; Punjab has continental climate, fierce summer heat alternating with winter cold, sometimes down to the freezing point, while Kerala has tropical maritime climate with almost unvarying warmth and uniformly moist air.

In the Thar desert the average rainfall is less than 13 cm. in a year, while at Cherrapunji it is as much as 1,080 cm. In the rainy season, places like Simla in the Himālayas get clouded for days on end, the air saturated with moisture, while in the dry hot months the air may occasionally be almost completely devoid of moisture.

Many of the weather systems which make up the climate of this vast region are largely dependent on conditions outside its geographic limits. For instance, the cold weather rain and snow-fall in India are intimately connected with shallow low-pressure systems which originate in the upper levels of the atmosphere to the northwest of India—even as far away as the Eastern Mediterranean region; and the distribution of rainfall in the summer monsoon season depends largely on conditions in East Africa, Irān, Central Asia and Tibet, as also upon the pressure and temperature conditions in Southern Asia, the Indian Ocean and the China seas.

The recording of meteorological observation in India started towards the end of the 18th century, during the East India Company's time. Well-equipped meteorological observing stations were established at Madras (1796), Simla (1840) and Bombay (1841), and on the Nilgiri (1847). In 1874-75 arrangements were made for organized work of observation over the whole of India, by the establishment

Meteorological observations

of a Meteorological Department under the Central Government, amalgamating a number of Provincial meteorological organizations which existed till then. This enabled the adoption of uniform methods and systematic discussion of the facts recorded over a period of time. The organization was enlarged and improved upon from time to time; sixty to eighty years of records can be obtained in the archives of the Indian Meteorological Department. The number of observation centres in 1961 was over 400.

A significant development was the introduction, in the twenties of the present century, of measurement of wind directions and speeds at various heights above the surface by means of pilot balloons; along with it came measurement of upper air temperatures and humidity by means of recording meteorographs sent up with big balloons. The number of upper-air stations was increased gradually and improved techniques including radio methods came into use during and after World War II. Air services across the country brought about rapid expansion of the meteorological network and modernization of techniques. Climatological data for the country as a whole, adequate both in amount and quality, are now available.

Chains of observatories have also been built in most of the countries in South Asia. International agreements have made it possible to exchange data between different countries. A study of the meteorology of the Indian subcontinent has to be based on the data collected not only within the country, but also from outside.

## 2. *Climatic Regions*

The broad picture of the climate of a region is determined by its geographical situation. Physiographical features of the region, however, strongly affect the ultimate pattern of its climate and bring about variations in different areas.

In the context of India's geographical situation, the most important feature of its climate is the alternation of seasons known as the monsoons. As a matter of fact, much of the monsoons the region lying within the Tropics and comprising the great continent of Asia to the north and the vast oceans to the south, and within this the Indian subcontinent in particular, makes a very good example of a monsoon area. During the winter third of the year, the general air flow over India is from

land to sea, and then over the Indian seas as the north-east monsoon. The winds are from continental sources and therefore mainly dry. In the summer months there is a complete reversal of the winds which flow from sea to land as the south-west monsoon. This is a season of high humidity, much cloud and frequent rain. Between these monsoons lie two transitional periods—the hot weather and the season of retreating south-west monsoon. However, the physical features of a country have a great influence on its climate, and this is well illustrated in the case of the Indian subcontinent.

India is separated from the rest of Asia by high mountains. Broadly speaking, the country consists of a peninsula to the

**Physical features** south of the Tropic of Cancer (or latitude  $23\frac{1}{2}^{\circ}$  N.), jutting well out into the Indian Ocean, and of a broad low alluvial plain to the north. The Peninsula comprises a plateau of comparatively low elevation, flanked near its western edge by the fairly high hills of the Western Ghāts from which the land slopes eastwards. A ridge, the Eastern Ghāts, lower in height and more broken than the Western Ghāts, forms the eastern boundary of the plateau. To the north of the Peninsula is the low plateau of Central India gradually sloping down to the broad lowland plain formed by the valleys of the Indus, Ganga and Brahmaputra. To the north of this extensive plain is the high barrier of the Himālayan mountains rising to an average height of 6·5 km.; and farther north is the Tibetan plateau with an average elevation of 3 km.

These physiographical features decide the climate of different areas in the country. The areas of very heavy rainfall are to the windward side of the Western Ghāts, the hills of Assam, and the Himālayan barrier; and these are the watersheds giving rise to the major river systems of the Indus, Ganga and Brahmaputra. Elsewhere, in the plateau of the Peninsula and the Ganga plains, the effects of orography are less marked and the rainfall is moderate. Southern Punjab and Western Rājasthān constitute the driest part.

It is possible to demarcate five regions with more or less similar broad patterns of climate and weather :

- (1) North-west India, comprising West Rājasthān, Punjab and Kashmīr.
- (2) Central India, which includes East Rājasthān, Gujarāt, the northern divisions of Madhya Pradesh, Uttar Pradesh and Bihār.
- (3) North-east India, comprising West Bengal, Orissa and Assam.

- (4) The plateau region comprising the southern divisions of Madhya Pradesh and the Deccan plateau.
- (5) The Peninsula consisting of coastal lands and plains.

### *3. Seasons and their Duration*

The Indian subcontinent presents a striking variety of meteorological conditions characteristic of the Tropics as well as the temperate zone. Tropical heat, high humidity, heavy and frequent rain, and fierce cyclonic storms prevail during part of the year, in some regions; in the remaining period the weather in some areas is marked by equable temperatures and moderate precipitation in association with shallow storms—conditions resembling those of South-eastern Europe and the Mediterranean regions.

The north-east and the south-west monsoons are the principal features in the meteorology of India. The Asiatic land-mass extending northwards from near the Equator modifies the pressure distribution and air movement over the Indian Ocean, the Arabian Sea and the Bay of Bengal. A permanent global air movement is converted into the periodic air movement of the monsoons. During the winter months the land-mass comprising Central and South Asia is cooler by as much as 8°- 14°C than the Pacific and the Atlantic Ocean areas in the same latitudes, while in summer the land-mass is from 5°- 8°C warmer than the sea surface. These differences in temperature form the basis of the monsoons. The point will be considered later in detail.

Between the two principal monsoon seasons are two transitional periods—the hot weather before the advent of the south-west monsoon and the retreating south-west monsoon season. The year may be conveniently divided into the following four principal seasons :

- (1) Cold weather season, December - February.
- (2) Hot weather season, March - May.
- (3) South-west monsoon season, June - September.
- (4) Retreating south-west monsoon season, October - November.

In October, clear weather sets in over North-west India and by December this extends over the whole of the country, except in the extreme south-east of the Peninsula where the cold weather retreating south-west monsoon continues to give cloud and some rain. The cold weather season starts early in December. At the beginning of January, when the

temperatures in Asia are at their lowest, the north-east monsoon is fully established over the Indian land and sea areas. A belt of high pressure extends from the Western Mediterranean through Central Asia up to North-east China. Clear skies, fine weather, light northerly winds, low humidity and temperature, and large day-time variations of temperature are the normal features of the weather in India from December to February. The settled conditions are broken at intervals by shallow cyclonic depressions travelling eastwards across Irān and Northern India, and often into China. These western disturbances are similar in type to the depressions of European latitudes, though they are usually less intense. The precipitation associated with the passage of these disturbances is generally small in amount, but is very important for winter crops in North-west India. Some of the western disturbances during their eastward passage give light rain over the whole of Northern India ; others confine their activity to the extreme north and give moderate to heavy rain in the Punjab plains and heavy snow-fall in Kashmīr and the higher Himālayas. The disturbances are accompanied by clouding and rise of temperature in front of them, while in their rear dry clear weather prevails with stronger westerly to north-westerly winds bringing a spell of colder weather. The fall of temperature in the rear of the disturbances may be considerable, giving rise to pronounced cold waves. For the season, as a whole, rainfall is greatest in the north-west and decreases towards the south and east ; the temperature is lower in the north-west than in the east and south.

The average winter conditions over India are illustrated in Map II for January, a typical cold weather month.

March to May is usually a period of continuous and rapid rise of temperature and fall of barometric pressure in North India.

**Hot weather** At the same time, there is a decrease of temperature in the Southern Indian Ocean and adjacent land areas of Africa and Australia along with a rise in air pressure and intensification of the southern high-pressure area (anticyclone). A steady transference northward of the area of greatest heat, along with a similar transfer of the equatorial belt of low air pressure, takes place. In March the highest day temperatures of about  $38^{\circ}\text{C}$  occur in the Deccan plateau, while in April temperatures of  $38^{\circ}$ -  $43^{\circ}\text{C}$  are found in Gujarāt and Madhya Pradesh. In May, the highest temperatures occur in Northern India, particularly in the desert regions of the north-west, where the maximum may be over  $48^{\circ}\text{C}$ . The area of lowest air pressure also lies over North-west India with a trough stretching from there to the Chota Nāgpur plateau. Around this trough a local

circulation of air sets in during this period of rising temperature and decreasing air pressure. This circulation is very significant, since it causes indraughts from the adjacent seas of southerly winds across the West Bengal coast and north-westerly winds across the Bombay coast. Violent local storms often form in regions where deep humid winds from the sea meet hot dry land winds. These storms are accompanied by violent winds, torrential rain and hail ; they sometimes attain tornadic intensity and are very destructive, especially in West Bengal. They are called Nor'westers because the accompanying squalls usually come from the north-west, and they are known in Bengal as *Kālbaisākhi*, i.e., "calamity of the month of *Baisākh*". In the drier parts of North-west India dust-storms are of common occurrence during this season.

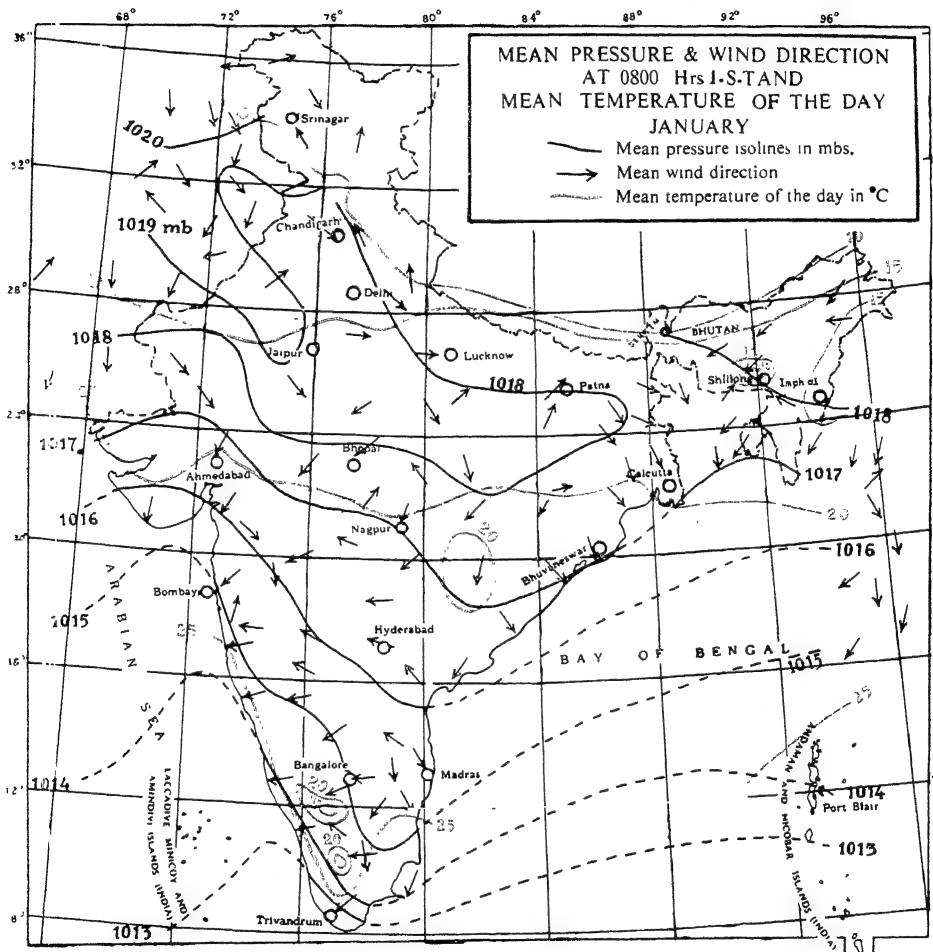
The normal distribution of meteorological elements during the hot weather is depicted in Map III for April, the representative month of the season.

It is obvious that cold weather in India is determined mainly by conditions on the Asian continent, while hot weather is more dependent on local conditions within the country.

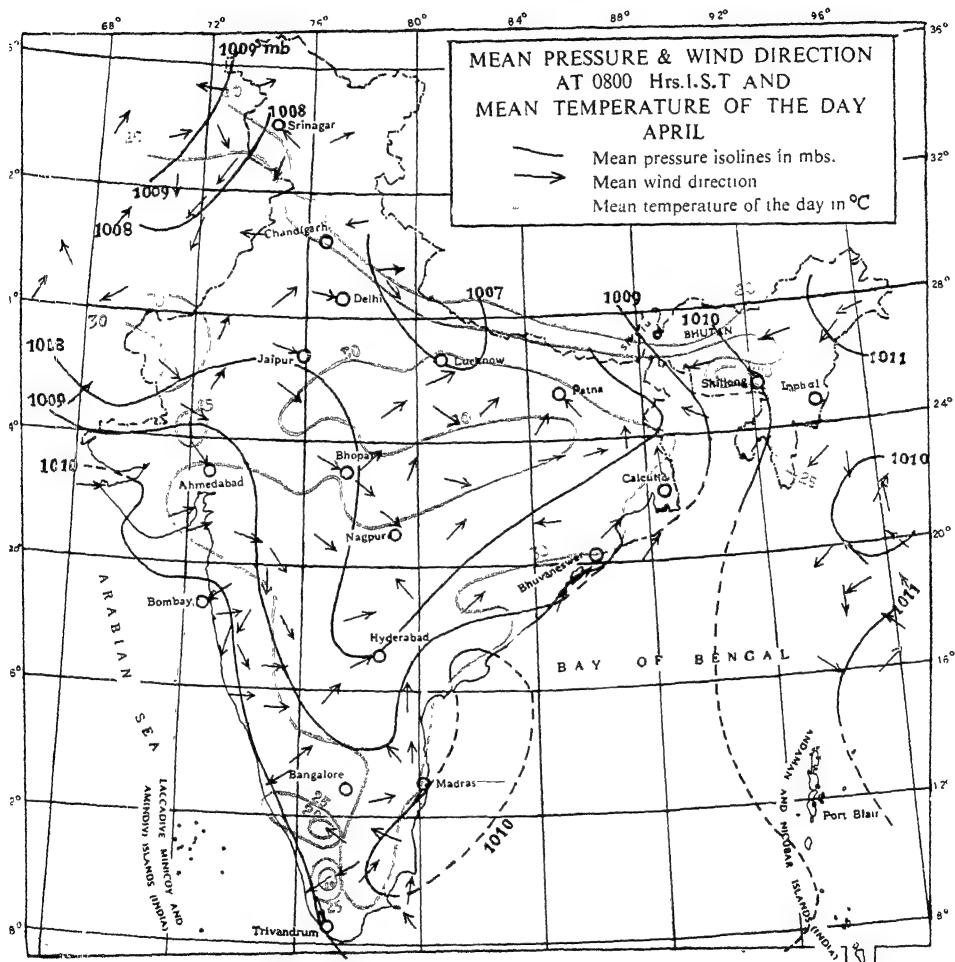
**South-west monsoon** During the south-west monsoon, weather in India is mainly decided by conditions in the oceanic area to the south.

In consequence of the rapid rise of temperature in May over the Asian mainland, the air pressure decreases in that area. At the end of May, the Asian high-pressure region is replaced by a fairly deep low-pressure area extending from Sudan in Africa to West Rājasthān and thence to West Bengal. The air circulation in the Indian area and the neighbouring seas becomes more and more vigorous. This goes on until, almost abruptly, the south-east trade winds from the south of the Equator, having had a long journey over the ocean, extend northwards into the Bay of Bengal and the Arabian Sea. They are caught up in the air circulation over India and deflected inland as south-westerly winds. Almost the whole of the country is then quickly overrun by this cool and humid air, known as the "South-west Monsoon".

Normally, the south-west monsoon bursts on the Kerala coast during the first five days of June. Slowly it extends northwards and by the end of the month it is usually established over most of the Indian area. In the first half of the wet season, June and July, the south-west monsoon current covers the whole of the sub-continent ; and this is in a way the most important season of the year for most of the area. The agricultural prosperity of the land depends to a large extent on the amount and distribution of rainfall during these two months.



METEOROLOGICAL MAP II



METEOROLOGICAL MAP III

The orographical features of India have a pronounced effect on the flow of monsoon winds over the country and the distribution of rainfall. The Himalayan mountains to the north and their spurs to the north-east constitute two closed sides of a box, as it were. Through the other two open sides of this box, to the south and west, the monsoon current streams in. The monsoon wind in the south Bay of Bengal is mainly directed towards the Burma coast; a part of this air stream also advances northwards and is then deflected by the Arakan hills westwards up the Ganga plain. The result is that at the head of the Bay of Bengal the mean direction of the monsoon winds is more from south-east and south than from south-west. The advancing monsoon winds cross the coast of deltaic Bengal and almost immediately come under the influence of the Assam hills and the eastern ranges of the Himalayas. As they pass into the box formed by the Assam and Chittagong hills they become subject to a vigorous ascensional movement and pour out a great deal of rain on the southern face of the Assam hills. This area has probably the heaviest rainfall in the world. The rest of the monsoon current is deflected westwards by the high barrier of the Himalayan ranges, the lower southern slopes of which receive almost daily rain along the whole region from Sikkim to Kashmir.

The monsoon currents of the Arabian Sea branch, as they reach the Bombay coast, are directed from the west-southwest or west to meet the almost continuous hills of the Western Ghāts rising abruptly from the coastal plains to heights of 1 to 2 km. The moist air currents move upwards along the mountains and the forced ascent causes frequent and very heavy rain over the Western Ghāts; heavy rain falls also in the coastal Districts to the west of the Ghāts. Having surmounted the Ghāts the monsoon winds advance over the Deccan plateau and Madhya Prādesh and pass into the Bay of Bengal, meeting the Bay current. Another part of the Arabian Sea branch of the monsoon crosses the coast of Saurāshtra and Kutch and passes over the arid sandy plains of West Rājasthān, giving little rain in these areas until it reaches the Arāvalli hills. The winds then pass on north and north-eastwards and on reaching Eastern Punjab intermingle with the current deflected westwards from the Bay of Bengal. The mixed current is then partly deflected further westwards and partly forced up the southern slopes of the Himalayas. The merging of the two currents occasionally gives moderate to heavy rain in the Western Himalayas, Eastern Punjab and East Rājasthān.

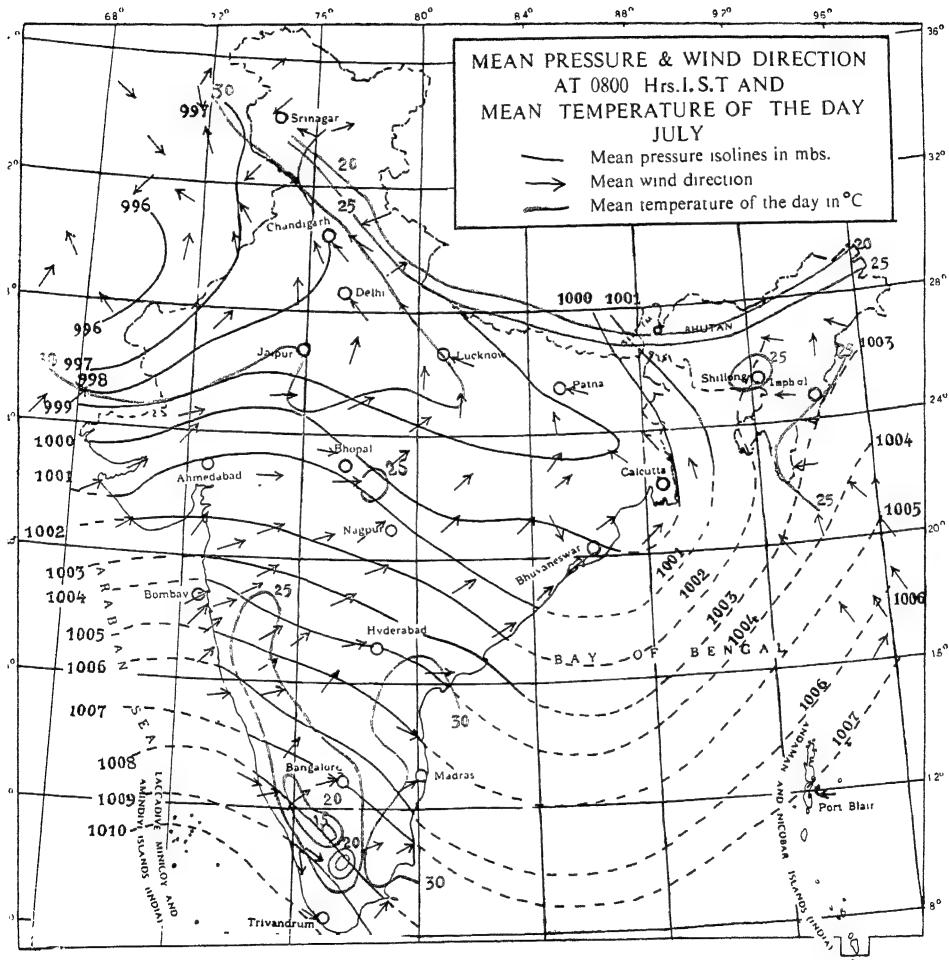
A description of the south-west monsoon cannot be complete without reference to conditions in the south of the Indo-Ganga

plain lying between the fields of direct activity of the Bay of Bengal and the Arabian Sea branches of the monsoon. The air pressure in this area is now lower than in the area immediately to the north or south. This "monsoon trough of low pressure", as it is called, has its axis normally extending from North-west India roughly through Agra, Allahābād and Hazāribāgh into Orissa. Map IV giving the mean meteorological conditions in July illustrates the characteristics of the south-west monsoon season. Cyclonic depressions, which occasionally form in succession during this season at the head of the Bay of Bengal, tend to travel along the axis of this monsoon trough; and during their passage west to north-west they intensify the monsoon currents as well as concentrate the rainfall in their vicinity. It is mainly from the travel of these depressions along this track that locally heavy rain occurs in the rice-growing Districts in and around Madhya Pradesh.

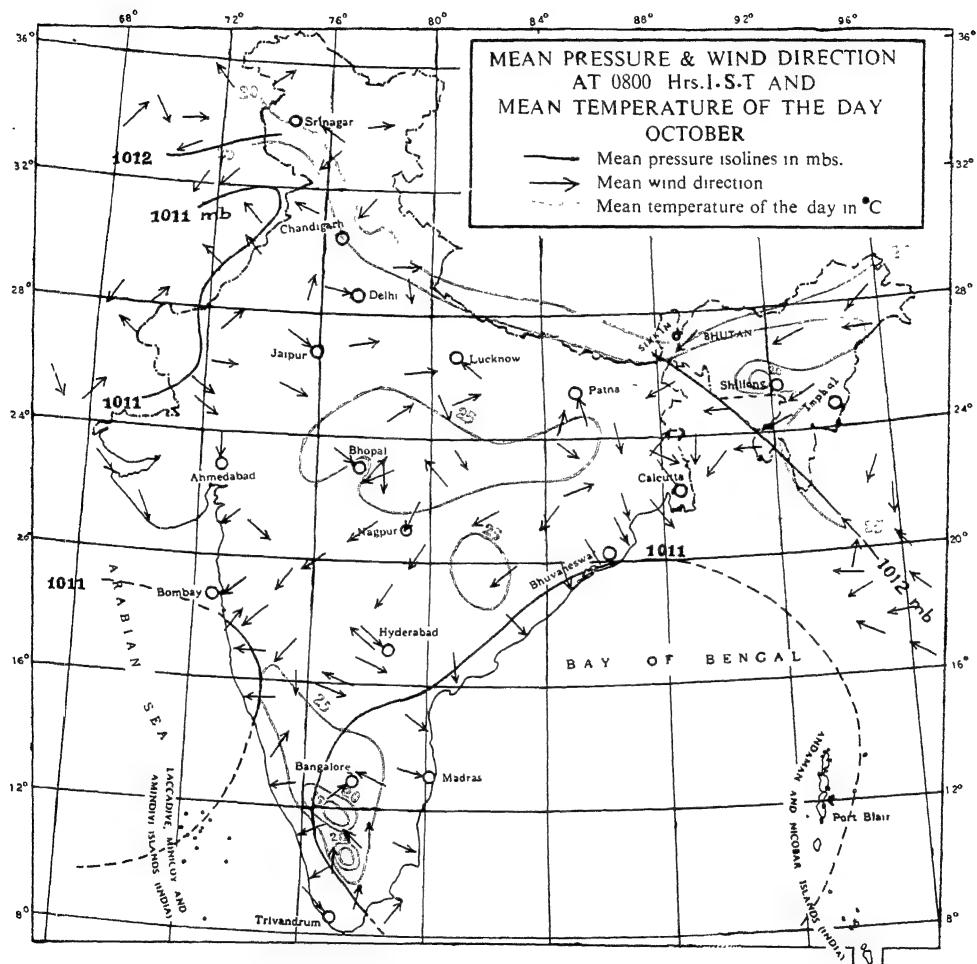
The monsoon trough, however, does not remain stationary. It moves north or south, sometimes to a considerable extent; and the distribution of rainfall is appreciably affected as the trough moves. Consequently, the monsoon season is by no means a period of continuous rain in any part of the country. There are alternations of bursts of general rain with partial or general breaks. This pulsatory character of the monsoon rainfall is one of the most significant features of the period meteorologically, and also economically in relation to the growth of the crops of the season. Generally speaking, the strength of the monsoon current and the associated rainfall increase from June to July and remain fairly steady in August. The monsoon begins to retreat from Northern India in the second week of September, rainfall decreasing rapidly in the latter half of the month.

October and November are a period of transition leading up to the conditions of dry winter season. The change begins in early October and is usually completed by mid-December. The Arabian branch of the monsoon retreats southwards from Rājasthān, Gujarāt and the Deccan by a series of intermittent actions, while the Bay of Bengal current retreats comparatively steadily down the Ganga plains. The low-pressure conditions prevailing in North India in the monsoon season are obliterated by October. They are transferred to the centre of the Bay of Bengal by the beginning of November, and to the south of the Bay early in December. By the end of December, the belt of low pressure usually passes out of the limits of the Bay of Bengal into the equatorial belt of the Indian Ocean. Similar conditions obtain

**Retreating  
south-west  
monsoon season**



## METEOROLOGICAL MAP IV



METEOROLOGICAL MAP V

in the Arabian Sea. The general meteorological features of this season are illustrated in Map V.

This season is marked by dry weather in Northern India, but is associated with more or less general rain in the coastal Districts of Madras and over the eastern half of the Peninsula, where October and November are often the雨iest months of the year. These rains are generally known as the north-east monsoon rains. The heaviest and most widespread rainfall at this time of the year occurs during the passage of cyclonic storms. They form in the sea areas adjacent to the Peninsula and advance westwards or north-westwards and sometimes north and north-eastwards. The Bay of Bengal cyclones mostly advance towards the east coast of the Peninsula, while a few strike the Bengal coast or the Arakan coast of Burma. Cyclonic storms are much less frequent in the Arabian Sea than in the Bay of Bengal; in fact, it is often the Bay of Bengal storms that cross the southern Peninsula and emerge into the eastern Arabian Sea where they may reintensify.

The most important feature of this period is thus the gradual withdrawal of the south-west monsoon from the Indian area and the gradual extension of the winds of the dry season from Northern India eastwards and southwards over the entire land and sea areas. The region of transition between these two different air-masses—the “front” between land and sea air—provides the most favourable conditions for the development and growth of cyclonic depressions and their intensification into severe cyclones of the Indian seas.

Usually, before the end of December, the north-east monsoon winds are fully established over the whole region. So the changes in the transitional period of the retreating south-west monsoon are much more gradual than the changes at the start of the monsoon season. The advancing currents move vigorously while the retreating currents are feeble. Rainfall from the decaying current is much less than in the three preceding monsoon months, and is more irregular in distribution. For example, the whole of North-western and Central India and Gujarat hardly get any rain during this period.

#### 4. *Rainfall*

Of all weather elements, rainfall is by far the most important for a country like India whose economy is largely based on

agricultural enterprise. The timely distribution of monsoon rains is the biggest single factor which determines the country's prosperity. It has been aptly stated that India's prosperity is a gamble in the monsoon rains. The principles behind the physical processes that lead to the formation of clouds and rain may be briefly stated before the seasonal distribution of rainfall in India is surveyed.

Air always contains a certain amount of water-vapour, the amount varying from time to time and from place to place. The moisture content of any air-mass depends on whether its source is a maritime or continental region and whether it has travelled over sea or dry land. Further, the capacity of air to hold moisture depends on its temperature—the higher the temperature, the greater the capacity to hold water-vapour. When air at a certain temperature has as much water-vapour as it can retain, it is said to be saturated. Very often air is not saturated; then the ratio of the actual amount of water-vapour present, to the amount needed to saturate the air, determines the relative humidity. This relative humidity is usually expressed as a percentage. Air saturated with water-vapour has a relative humidity of 100 per cent; when it contains only half that amount of moisture, its relative humidity is 50 per cent.

When a sample of air which is initially unsaturated is cooled its relative humidity increases; by progressive cooling it can be made to reach a stage when its moisture content will make it saturated with 100 per cent humidity. What happens when this sample of air is cooled further? At a still lower temperature the air needs less moisture to remain saturated; hence, the excess over this amount becomes surplus. The chilled air cannot hold it and it condenses into very tiny water droplets. These float as mist or fog near the ground and as cloud in the upper air. From the cloud stage to the formation of rain the tiny water droplets pass through a complex process. They coalesce into larger water-drops, which the air cannot support in suspension, and come down under the action of gravity as rain.

When air is made to ascend suddenly and rapidly, it cools down at a rate depending upon the amount of water-vapour present in it, or upon its relative humidity. Dry air cools at a rate of nearly  $10^{\circ}\text{C}$  per km. of ascent, but when saturated with water-vapour (with relative humidity 100 per cent) its rate of cooling drops down to about half this rate. As an air-mass, originally unsaturated, is subject to forced rapid ascent, a stage is reached when its temperature falls low enough for the moist air to reach the saturation point; and any further ascent and cooling

of the air is followed by the water-vapour in that air-mass condensing into cloud droplets. If the ascensional movement continues further, and the other conditions favourable for coalescence of the cloud-drops into larger water-drops exist, the result is rain.

The ascent of an air-mass is brought about in several ways. Firstly, there is the heating of the land surface by strong insolation during day-time, as in summer; the air in contact with the hot surface also gets heated, expands and rises up. This process is best exemplified by the formation of clouds in summer afternoons and evenings, and by the marked tendency towards the occurrence of summer thunder-showers in the afternoon and evening at places where the rising air happens to be sufficiently humid.

Secondly, an air current may be forced to rise when it comes across a range of hills as a barrier across the wind flow. As a result of this orographic barrier, the air is forced to ascend up the hill slopes; in that process it is cooled sufficiently to reach the stage of cloud formation, and eventually the rain stage if its moisture content is high enough and its upward flow is maintained. This is well illustrated by the occurrence of heavy orographic rainfall on and near the hill ranges of the Himālayas and the Western Ghāts and the rapid decrease of rainfall as the air passes over the hill crests. After crossing the crest the air may start descending. Some of the most well known wet regions of the world are located near hill slopes.

Thirdly, dynamical causes may force an air current to rise on a large scale. This happens, for instance, within the field of a cyclonic storm and near its centre. It is well known that air from all sides flows in towards the inner area of a cyclone, the air streams converging towards the low-pressure centre. This air, accumulating in the inner area of the storm and prevented from escaping horizontally, is subjected to a vigorous ascending movement; and since there is usually enough moisture in this air, a heavy downpour of rain in the inner storm area of the cyclone takes place. The regions along and near the tracks of cyclonic depressions are, in consequence, areas of heavy rainfall.

Brief references have been made in the preceding section to rainfall in India in different seasons. This may now be considered in some detail.

It has already been mentioned that the precipitation of the cold weather period occurs in association with the passage of shallow but extensive low-pressure systems or depressions across Northern India from west to east. On an average, four or five of these western disturbances may be expected each month of

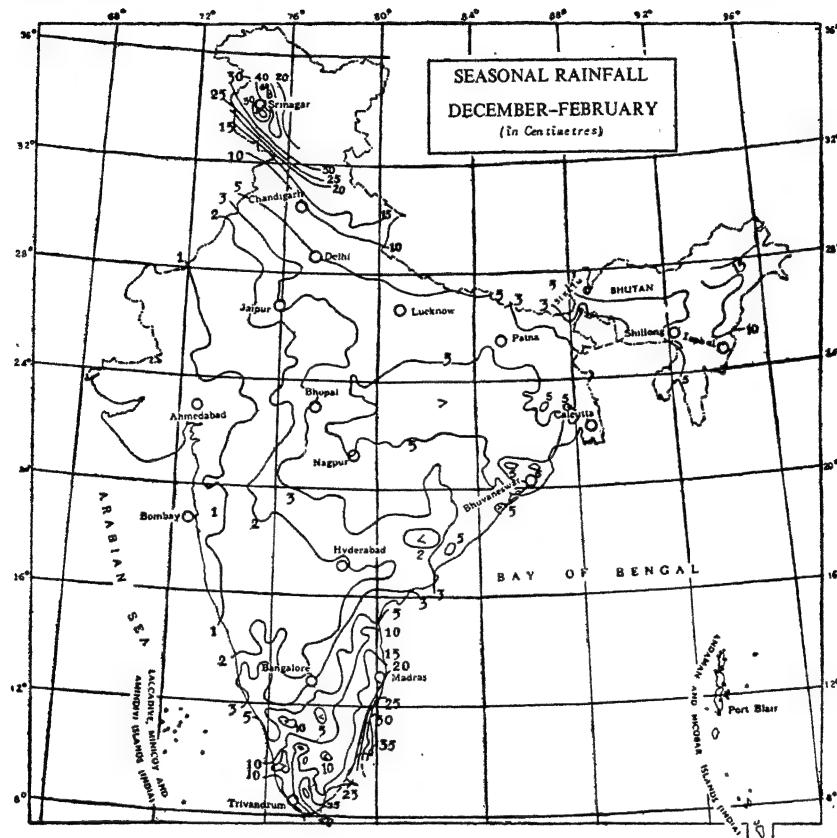
this season to enter India and break the general run of dry clear weather. All these depressions are not equally active so far as their capacity for rain is concerned. Usually, within Cold weather rainfall the fields of these depressions, the condensation takes place in upper air levels at heights above 3 km. from the surface. So, the distribution of precipitation is hardly modified by the terrain except near the mountain ranges of the Himālayas which are sufficiently high to affect air currents above 3 km. and force the winds up the higher mountains on a large scale. The precipitation is accordingly quite large over the higher interior ranges and moderate over the lower outer ranges of the Western Himālayas. It is in this season that the main additions are made to snow accumulations over the Himālayan mountains.

The precipitation decreases from the submontane Districts of the Himālayas southwards, and also eastwards from Punjab to Bihār. It increases in West Bengal and Assam since, by that time, more moisture-bearing winds are drawn from the north Bay of Bengal into the fields of the travelling depressions. Rainfall is of the order of about 50 mm. in Punjab and Assam and varies from about 18 to 25 mm. elsewhere in Northern India. Occasionally, these western disturbances give rainfall in the central parts of the country as well as in the northern Districts of the Peninsula. Even though the cold weather rainfall in Northern and Central India is small in amount, compared with the rain of the south-west monsoon, it is of great economic importance over most of those areas ; upon this rainfall depend the crops of winter such as wheat.

To complete the picture of winter rains, the south of the Peninsula must be mentioned. It has been stated earlier that the retreating south-west monsoon current continues to give occasional rain in December in the south of the Peninsula in association with cyclonic storms and depressions from the Bay of Bengal. On the average, one such fairly well developed storm may be expected to strike the east coast of the Peninsula south of Madras and bring heavy rain to the coastal Districts once in three years. The rainfall decreases rapidly inland in amount and frequency, so that it is only about 25 mm. in the Mysore plateau. A few light showers occur in this region in January as well.

The total average precipitation in Northern India is about 250 mm. in the Western Himālayas, diminishing southwards from the Himālayas across the submontane Districts to a smaller amount in the plains. It is only on approaching South-east Madras that the rainfall again increases to over 250 mm. on the south

Coromandel Coast in December, decreasing rapidly inland to only about 25 mm. in the Mysore plateau. The seasonal rainfall distribution and the number of rainy days\* is shown in Map VI.

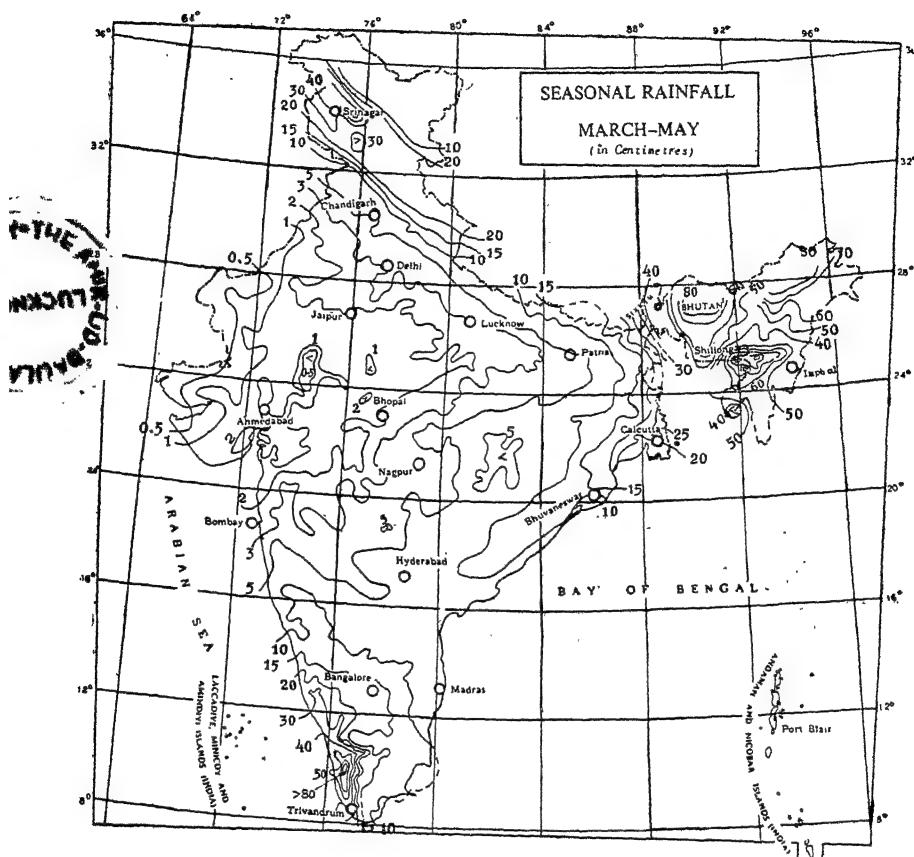


METEOROLOGICAL MAP VI

The distribution of rainfall in the hot weather season is quite different from that of the cold weather, as will be evident from Map VII.

Hot weather rainfall In the earlier part of the hot weather, in March, western disturbances continue to enter India and occasionally bring rain to parts of North-west India. In their further eastward passage they give rise to thunderstorms, which are sometimes severe and accompanied by hailstorms, in the Ganga plain and in North-east India. As the season advances, thunder-showers occur more frequently and the rainfall becomes heavier. Occasionally, the

\*A rainy day is defined as one in which at least 2.5 mm. of rain has been gauged in 24 hours.



METEOROLOGICAL MAP VII

thunder-showers attain great intensity and even tornadic violence, particularly in West Bengal and Assam. In the comparatively drier zone of the interior, the rainfall in the hot weather period is often preceded by dust-storms and is usually small in amount, as for example in Bombay, Berār, Madhya Pradesh, Rājasthān, and the Ganga plain. The rainfall caused by thunderstorms in Assam and West Bengal is larger in amount. Economically, the rainfall of this season is of importance in Assam for its tea crop and in West Bengal for the early spring crop of rice. Over the greater part of the rest of the country, in the plains of the interior of India, the rainfall of this season is of little agricultural value. The thunderstorms may be accompanied by hail which causes damage to crops and orchards.

In the south of the Peninsula, thunderstorm rain occurs chiefly in April and May; the distribution is irregular and the amount averages from 75 to 100 mm. Kerala gets moderate to

large rainfall in May on account of temporary incursions of the south-west monsoon causing widespread thunder-showers on the West Coast. In the north-west of the Peninsula, this is a season of dry winds with little or no rainfall until the end of the season, when temporary and shallow incursions of the monsoon winds give rise to pre-monsoon thunderstorms.

The total rainfall of the period is less than 25 mm. in Rājasthān, Gujarāt, Khāndesh and Madhya Pradesh; and it varies between 50 and 140 mm. in the submontane Districts of Punjab and Uttar Pradesh, in Bihār, West Bengal and Orissa, and over the greater part of the Peninsula. It exceeds 250 mm. in Kerala, while it is over 500 mm. in Assam.

In a way, it is upon the rainfall of the south-west monsoon season that the agriculture of the greater part of India depends. This

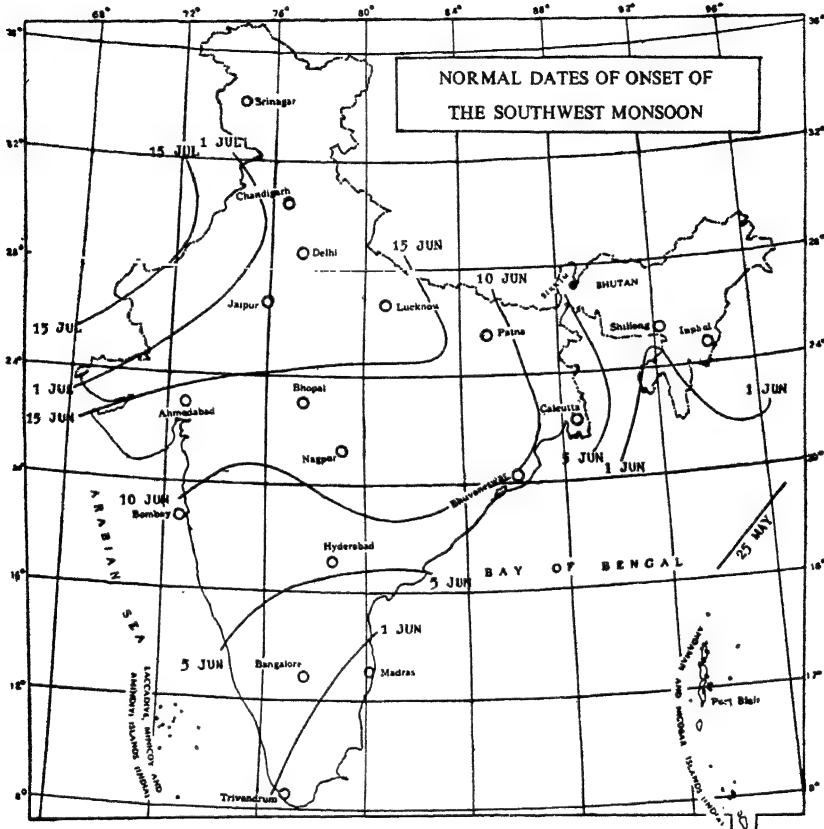
Rainfall of south-west monsoon extensive moist air current from the ocean area, reaching considerable vertical height, is responsible for nearly 90 per cent of the rainfall of the whole year, except in the southern parts of the country.

It has been stated before that towards the end of May, when the weather is at its hottest in India, south-east trade winds in the Indian Ocean advance rapidly northwards across the Equator into the Arabian Sea and the south Bay of Bengal; and in the course of about a fortnight, the monsoon winds establish their sway over the whole of these sea areas. Then the monsoon is very often ushered into the land areas by a cyclonic storm either in the Bay of Bengal or the Arabian Sea.

The monsoon enters the Indian area in two main currents, the Arabian Sea and the Bay of Bengal currents. The former strikes the West Coast, giving heavy rain to the coastal Districts south of Bombay and on the hills of the Western Ghāts. After crossing the Ghāts, the monsoon winds branch into two streams. The southern stream blows across the Peninsula and brings occasional rainfall associated with thundery weather; the northern part crosses the Kāthiāwār coast, gives rain mostly in the coastal Districts, and then blows across Rājasthān, causing precipitation near the Arāvalli hills and the Punjab-Kumaun hills, but very little in the plains of Rājasthān. The Bay of Bengal current also splits into two branches. One advances up the Burma coast; the other, which crosses the West Bengal coast, is directed westwards up the Ganga plain by the deflecting action of the mountains to the east and north of West Bengal.

Normally, the monsoon rainfall extends into Gujarāt and the central parts of the country in the second week of June and into Uttar Pradesh by the middle of June. It is more or less established

over the entire country by the end of the month. Map VIII illustrates the normal dates of the onset of the south-west monsoon and its progressive establishment over different parts



METEOROLOGICAL MAP VIII

of the country. It will be seen from this map that by the first week of July the entire country is overrun by the humid monsoon air and the rainy season is well established in all the regions including the neighbouring sea areas.

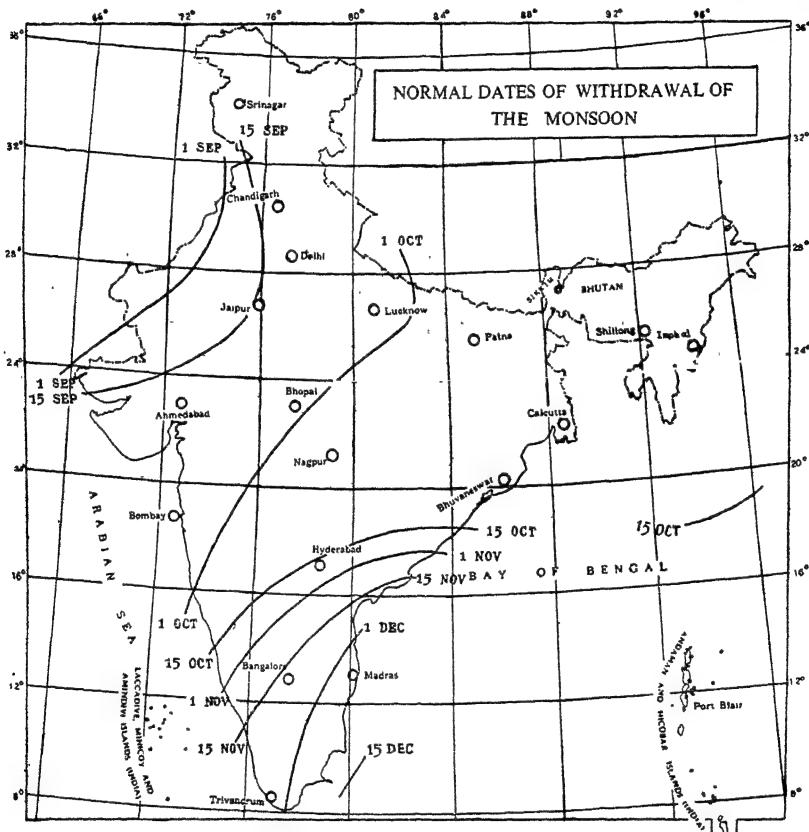
During July and August, the humid winds of the south-west monsoon blow more or less steadily over the Indian area and carry rainfall to its farthest limits. The two main factors that determine the activity and strength of the monsoon and largely influence the distribution of rainfall are the position and strength of the trough of low pressure over the Ganga plain and the frequency of depressions from the Bay of Bengal. The trough of low pressure exists throughout the monsoon season, between the westerly winds of the Arabian Sea current and the easterly winds

of the deflected Bay of Bengal current. The easternmost end of the trough usually extends into the head of the Bay of Bengal just before the formation of a depression there. At the time these depressions form, there is usually a weakening of the monsoon and decrease of rainfall in West Bengal and Assam. Then, as a fresh pulse of the monsoon advances up the Bay, a depression begins to develop and rainfall increases on the Burma coast. Often, a low-pressure wave from the east across Burma helps the development of these depressions.

A considerable proportion of the monsoon rainfall over the greater part of India is in association with the movement of cyclonic depressions from the Bay of Bengal. They travel somewhat slowly and often traverse the whole of Northern India. As the depression moves from the head of the Bay of Bengal towards the coast, rainfall extends into Southern or South-eastern Bengal and Lower Assam. With the further movement of the storm westward, the belt of moderate to heavy rainfall extends to Orissa, Chota Nāgpur and Bihār. By the time the storm crosses the Orissa coast and enters Madhya Pradesh, the Arabian Sea current is strengthened and moderate to heavy rain once again extends to Madhya Pradesh and the southern Districts of Uttar Pradesh as well as over the north of the Peninsula. The rainfall may then be carried by the depression into Rājasthān and Gujurāt before it merges in the seasonal low pressure over North-west India. Sometimes the depression curves round and, continuing to move more to the north, eventually breaks up in the submontane regions of Punjab or over Kashmīr. On such occasions, with a strong Arabian Sea branch of the monsoon feeding extra moisture into the storm area, there is very heavy rain in the hill Districts. After the dissipation of a depression the monsoon weakens generally and the rains slacken; but with the next strengthening of the monsoon in the sea and its revival, another depression forms at the head of the Bay of Bengal and as a consequence there is rainfall, somewhat similar to that associated with the depression preceding it. On an average, about eight such cyclonic depressions of moderate to severe intensity pass from the Bay of Bengal into the land area between June and September.

In the absence of these depressions, the distribution of rainfall in this season is strongly influenced by orography and the position of the monsoon trough of low pressure. A more southerly position of the axis of the trough is favourable for the general activity of the monsoon and widespread rainfall occurs over most of the country. On the other hand, a more northerly position of the

trough results in a shift of the rainfall further northward into the foot-hills of the Himālayas. Then there is a decrease in the activity of the Arabian Sea branch of the monsoon, while the Bay branch limits itself to North-east India—Assam in particular. Such a situation is referred to as a “break” in the monsoon. These breaks, when prolonged and associated with continuous heavy rains in the catchment of the Himālayan river systems, cause floods in the rivers while there may be very little rain in the plains.



METEOROLOGICAL MAP IX

Prolonged breaks generally occur in August and September and sometimes in July.

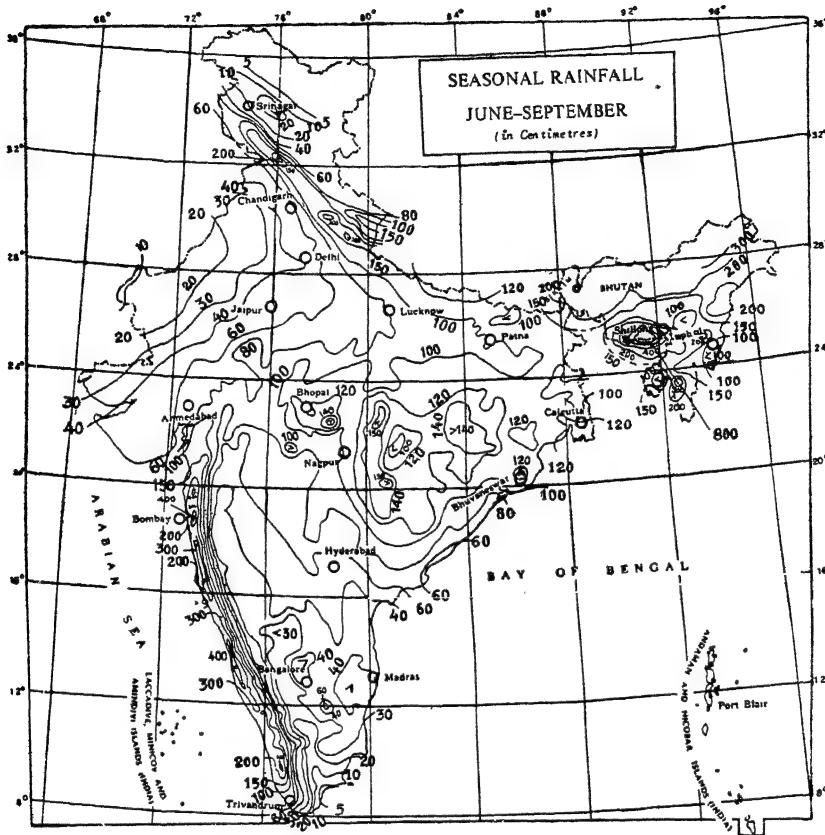
During September occurs the gradual weakening of the monsoon and its withdrawal from North-west India. As the month advances, the monsoon trough of low pressure weakens and extends further south into the Bay of Bengal. The depressions form in more southerly latitudes and after advancing initially westwards into the land area, take a more north-westerly or

northerly course towards the Himālayas where they break up. These cause occasional spells of heavy rain on and near the Punjab-Kumaun hills and in the adjoining plains. In the Deccan plateau the intervals between rainy spells increase in September and the rainfall is usually associated with thunder, conspicuously absent earlier in the monsoon season in the Peninsula. The monsoon withdraws from North-west India by the third week of September and from West Uttar Pradesh, the western divisions of Madhya Pradesh, and Gujerāt by the end of the month. Map IX shows the normal dates of withdrawal of the south-west monsoon from the various parts of the country. There are wide variations in these dates; very often the withdrawal of the monsoon is not as clearly defined as its onset. Anyhow, by the middle of October the monsoon withdraws from over most of the country. The south-eastern coastal part of the Peninsula is an exception.

Map X showing the June-September rainfall distribution illustrates clearly the regions which have heavy precipitation as a consequence of orographic features helping the rapid ascent of monsoon winds. In June, rainfall exceeds 760 mm. along the west coast of the Peninsula, and is between 500 and 760 mm. in and near the Khāsi hills in Assam and in parts of Northern Bengal. It decreases to less than 250 mm. in West Bihār and Orissa and lies between 125 mm. and 250 mm. over most of Uttar Pradesh, Madhya Pradesh and Gujerāt. The average rainfall over the plains of India in June is 201 mm.

In July also, most of the West Coast gets about 760 mm. of rainfall, which increases to between 1,000 mm. and 1,270 mm. on the Ghāts. It falls off rapidly to the east of the Ghāts, being less than 125 mm. over the eastern Districts of the Peninsula south of latitude 16°N. while in the north the precipitation increases again to between 380 mm. and 500 mm. in Assam, the eastern Districts of Bengal, and Madhya Pradesh; it falls off again to less than 125 mm. in West Rājasthān. The distribution of rainfall in August follows the same general pattern as in July, except that the amounts are generally less—500 mm. to 760 mm. on the West Coast; a much smaller area in the central parts of the country receives a rainfall between 380 mm. and 500 mm. in August. The total average rainfall over the plains of India is 284 mm. and 262 mm. in July and August respectively.

The distribution of the September rainfall over the country is similar to that in August, but the amounts are still smaller; the contrast between the rainfall amounts on the windward side of the coastal hills and the interior on the leeward side is less marked. About 500 mm. of rain is received in the Western Ghāts in North



METEOROLOGICAL MAP X

Konkan and 250 mm. to 380 mm. in Assam and Northern Bengal. The rainfall decreases to 250 mm. in parts of South-western Bengal and is between 125 and 250 mm. over most of the country from the Deccan to Uttar Pradesh. In North-west India, to the west of the Aravalli hills in West Rājasthān, the rainfall in September is generally less than 50 mm. The average rainfall over the plains of the country in September is 178 mm.

It has been noted already that monsoon rainfall ceases in East Uttar Pradesh early in October. During the subsequent withdrawal of the Bay branch of the monsoon from over Northern India, these moist winds continue to give rain in North-east India until their final retreat from that region by the 10th of the month. About this time the Arabian Sea branch also withdraws from the central parts of the country and the northern areas of the Peninsula, and dry weather sets in over these regions.

Rainfall of  
retreating  
south-west  
monsoon

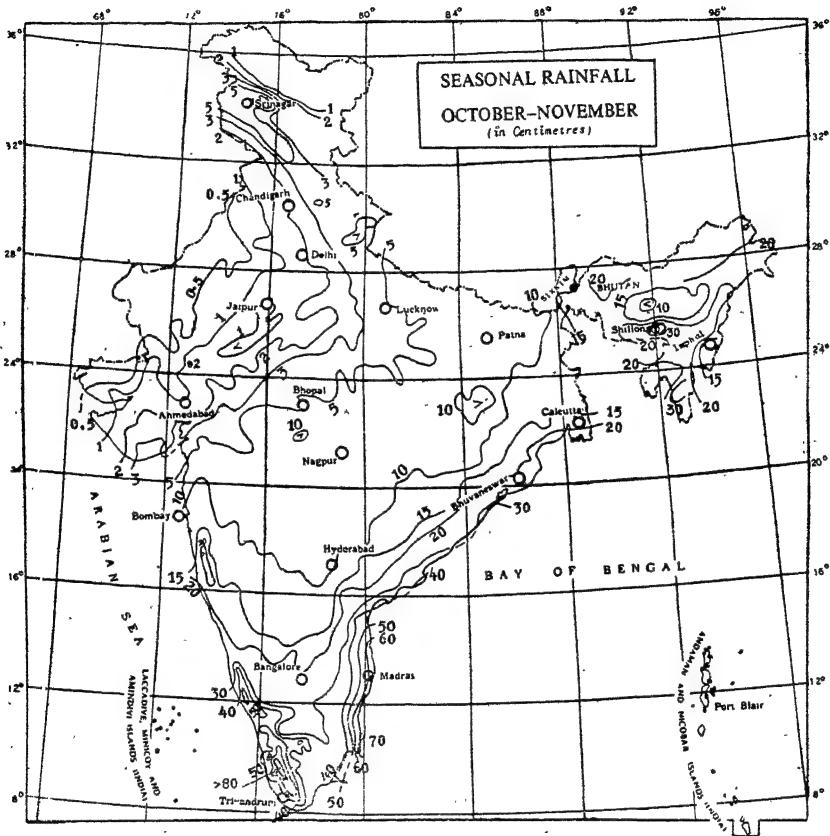
It has been observed already that, by the middle of October, the belt of low pressure which marked the monsoon trough during June to September over the Ganga plains is transferred to the centre of the Bay of Bengal. Under its influence the retreating monsoon current curves round and is directed towards the Peninsula from the north-east; this is sometimes designated as the north-east monsoon. The retreating monsoon winds, now much weaker and shallower, cause occasional showers in the east coast of the Peninsula, the amount of rainfall decreasing from the coast towards the interior. However, during October and November, cyclonic storms form in the Bay of Bengal and carry heavy rainfall along their track. Usually they travel towards the Bengal coast or towards the Burma coast in the earlier part of October; later in the season, they mostly strike the Northern Circārs or the Coromandel Coast and produce very heavy rainfall along the track of the centre of the cyclone. The Deccan and the Tamilnād Districts of Madras receive their rainfall in this season almost solely in association with these storms or depressions, and hence the rainfall distribution is very irregular.

The rainfall in October-November is shown in Map XI. The amount measured in October exceeds, on an average, 250 mm. on the south Coromandel Coast and South Kerala and is somewhat less than 125 mm. over most of the remaining parts of the country. In November the pattern of rainfall distribution is about the same as in October, but the total rainfall is between 250 mm. and 375 mm. on the south Coromandel Coast and less than 25 mm. in the rest of the area in the interior. The rapid decrease of rainfall as one goes from the Madras coast into the interior is a very striking feature of the rainfall distribution in this season. This is due to the heavy rainfall caused by the cyclonic storms as they strike the coastal regions. Rainfall is occasionally very heavy in the Nilgiri when the cyclonic storms or depressions from the Bay of Bengal advance into the interior Districts of Southern India and break up on the higher ranges.

The Table in Appendix A gives the normal monthly rainfall and normal annual rainfall for the thirty-one meteorological subdivisions of India.

It is clear from this account that the rainiest season is the south-west monsoon period, June to September, except in South-east Madras where the main rainy season is the October-November period; also, the cold weather rainfall during December and January, though scanty, is of great importance for the wheat crop of Northern India.

The average annual rainfall over the different regions of India is shown in Map I. The effect of the orographical features of the land on rainfall distribution is clearly brought out by the annual as well as the seasonal rainfall maps.



METEOROLOGICAL MAP XI

### 5. Rainfall Anomalies—Floods and Droughts

An important consideration in the rainfall distribution in any region, which is of great significance to agriculture and other enterprises depending on rain, is the variability of the precipitation received over different parts of the region in specific periods of time. The average annual rainfall in India and its seasonal distribution have been described in the previous section. The amount of precipitation received, however, varies considerably from year to year for the country as a whole; the variations may

be particularly large in certain divisions and Districts in some years.

The average annual rainfall in the plains of India is about 1,070 mm.; its variation from the normal has ranged between - 280 mm. in 1899 and + 305 mm. in 1917. Variations from the normal in the monsoon rainfall over the country can have four different aspects. Firstly, the beginning of the rains may be considerably delayed or be appreciably early over the whole or parts of the country. Secondly, there can be one or more breaks in the monsoon rains during July and August. Thirdly, the monsoon may withdraw earlier than usual and the rains cease before the due dates, or the rains may persist longer than usual because of a delayed withdrawal of the monsoon. Finally, the rainfall may be heavy and persist longer than usual in one part of the country while avoiding another area, thus bringing about serious anomalies in the distribution of the precipitation.

Long breaks in the monsoon rains or a sudden cessation of the rains during the season can be very harmful to crops and may lead to famine conditions. Some of the interior Districts in North-west India, Gujarāt and the Deccan plateau are particularly liable to occasional drought, the variability of the year's rainfall being as much as 100 per cent or more. Gujarāt is particularly liable to great variability of rainfall, since it is subject to scanty rain in some years and in others to excessive downpours caused by cyclonic storms or depressions moving over the area. Partial or large scale failure of the winter rains causes drought conditions mostly in Punjab and parts of the Ganga plain; but their effect is not so marked on the winter crops because of the irrigation facilities provided in these areas. Deficiency of rain in an area with a heavy average rainfall, as for example in parts of Northern Bengal, rarely affects the staple crops of the area to an extent which could be called crop failure due to drought.

The results of a drought may be scarcity or famine conditions, local or widespread. While such famines were at one time "the bogey of India's administrators," they are no longer regarded as major calamities. This is because the possible effects of a drought are negated by irrigation, the introduction of dry farming systems in areas liable to frequent droughts, and improvements in railway and road transport.

On the other hand, large tracts in India are liable to receive excessive rainfall and suffer from floods and waterlogging. Heavy downpours brought about by cyclonic storms and depressions from the Bay of Bengal or the Arabian Sea are often responsible for floods. Rainfall from 250 mm. to 500 mm. in one day is

not a rare occurrence; the heaviest recorded in the plains in a period of 24 hours was about 900 mm. at Purnea in North Bihār. This is exceeded only by the proverbially heavy falls at Cherrapunji in the Khāsi-Jaintia hills of Assam where, as has been discussed earlier, the orographic features of the region lead to exceedingly vigorous ascensional movement of the moisture-laden monsoon winds striking against hill slopes. The heaviest rainfall recorded in Cherrapunji is 1,036 mm. over a period of 24 hours. The Table below gives an idea of the heavy downpours which have exceeded 600 mm. in 24 hours.

*Table of stations in India which have recorded rainfall of 600 mm. or more in 24 hours*

S.No.	Station	Amount (mm.)	Date
1	Cherrapunji . . . . .	1,036	14-6-1876
2	Jowai (Assam) . . . . .	1,018	11-9-1877
3	Purnea (Bihār) . . . . .	889	13-9-1879
4	Nagīna (Uttar Pradesh) . . . . .	823	18-9-1880
5	Dhāmpur (Uttar Pradesh) . . . . .	772	18-9-1880
6	Najībābād (Uttar Pradesh) . . . . .	724	18-9-1880
7	Rewā (Madhya Pradesh) . . . . .	772	16-6-1882
8	Roha (Mahārāshtra) . . . . .	630	18-6-1886
9	Jalālpur (Gujarāt) . . . . .	657	28-7-1891
10	Nenotha (Assam) . . . . .	693	30-5-1893
11	Cherrapunji . . . . .	691	11-8-1893
12	Cherrapunji . . . . .	615	4-9-1897
13	Cherrapunji . . . . .	639	25-8-1898
14	Cherrapunji . . . . .	729	10-8-1902
15	Cherrapunji . . . . .	650	8-7-1903
16	Cherrapunji . . . . .	615	9-7-1903
17	Cherrapunji . . . . .	998	12-7-1910
18	Cherrapunji . . . . .	655	24-7-1910
19	Cherrapunji . . . . .	851	25-7-1910
20	Cherrapunji . . . . .	674	28-6-1911
21	Cherrapunji . . . . .	737	29-6-1911
22	Cherrapunji . . . . .	644	12-10-1911
23	Cherrapunji . . . . .	812	25-5-1916
24	Cherrapunji . . . . .	683	23-8-1932
25	Cherrapunji . . . . .	925	21-6-1934
26	Cherrapunji . . . . .	627	23-9-1940
27	Cherrapunji . . . . .	632	3-9-1951
28	Cherrapunji . . . . .	823	26-7-1952
29	Cherrapunji . . . . .	973	11-6-1956

### 6. Temperature and Humidity

Next to rainfall, temperature is perhaps the most important climatic factor in India from the economic point of view. Temperature, along with the amount of water-vapour present in the air, and rainfall virtually determine the character and extent of the principal crops.

Air temperature is measured at all stations under almost similar conditions. Protected from the direct rays of the sun, the thermometer is exposed in louvred boxes of standardized specifications through which the air circulates freely. The bulb of the thermometer is at a standard height of four feet above the ground.

The most important factors which determine the temperature of a place are the sun's altitude, latitude of the place, its elevation, its distance from the sea-coast and the character of prevailing winds, and hence indirectly the amount of cloud and rainfall. During January to May or June the heating of the air by the sun's insolation is greater than the loss of heat by radiation and other causes; hence, air temperature rises more or less steadily with the increasing elevation of the sun. In the rest of the year, the balance is on the other side and temperature steadily decreases from June or July to December.

In most countries July and August are at least as hot as June. But this is modified over the greater part of India by the effects of cloud and rain of the south-west monsoon. The annual variation of temperature is small in the extreme south and increases fairly rapidly northwards. Along the east and west coasts of India the variation of temperature is twice as great in Bombay as in Malabār. It is eight to ten times as much at places in North Deccan and Northern and Central India, and is at its maximum in the most inland parts of the dry Districts.

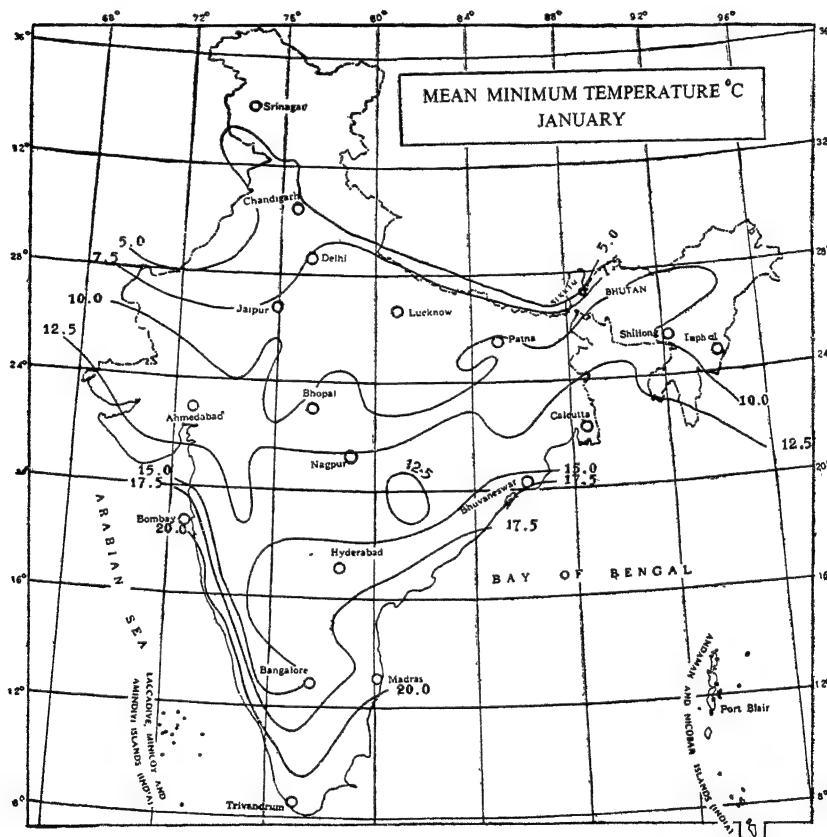
In the cold weather season, from the end of November to February, dry continental winds prevail over the greater part of India ; temperature increases from north to south. December and January are the coldest months, the mean maximum temperature ranging from about  $29^{\circ}\text{C}$  in parts of the Peninsula to about  $18^{\circ}\text{C}$  in the north-west, while the mean minimum temperature decreases from about  $24^{\circ}\text{C}$  in the extreme south to below  $5^{\circ}\text{C}$  in the north-west. In the rear of some of the western disturbances in the winter period, cold winds from the Caspian and Turkestān regions pour into India and cause a cold wave to sweep over a major part of Northern India, occasionally invading the northern regions of the Peninsula as well. During these cold waves the temperature

sometimes comes down to as much as 10°C below normal, with several degrees of frost, in the plains of North-west India.

In the hot period, March to May, temperature is highest in the interior where dry land winds prevail; there is a great contrast between the interior and the coastal Districts due to local sea-breezes. With the advance of the hot season, the warmest area slowly shifts from the South and Central Deccan to North-west India, the rise being more marked in the maximum than in the minimum. In March the mean maximum temperature generally exceeds 35°C in the south of the Vindhya range and is over 37°C in parts of the Deccan. In April the mean maximum temperature exceeds 37°C in Northern India over the region stretching from South-west Punjab to Chota Nāgpur, Orissa and the Northern Circārs, and rises above 40°C locally in Madhya Pradesh. The mean maximum temperature in May is over 40°C in most of North-west and Central India. On individual days in May, maximum temperatures exceeding 54°C have been recorded in Western Rājasthān and South-west Punjab. The mean minimum temperature exceeds 21°C over the entire country in May and is higher than 26°C in the eastern half of the Peninsula.

With the arrival of the monsoon rains the maximum temperatures fall rapidly in the north of the Peninsula and the central parts of the country; and with the extension inland of the monsoon in the second half of June and early July, there is a progressive decrease of maximum temperature in North-west India. The season as a whole has almost uniform temperature, varying only slightly in regions of frequent rain. Temperature rises whenever there is a break in the rains; but the hot spell never attains the same intensity as during the earlier hot weather months when the land lies parched under the tropical sun. In the areas which are only occasionally overrun by the monsoon winds, comprising South-west Punjab and North-west Rājasthān, the temperature is at its highest throughout the season but steadily decreases from June to August. In June, the maximum temperatures continue to be as high as in May, being over 40°C in North-west India. At many stations in Uttar Pradesh and Punjab, the highest temperature of the year is recorded in early June. In July, maximum temperatures exceed 37°C only in the Thar desert. In August there is a further general fall of temperature; but with the cessation of the rains in North-west India about the middle of September, temperature rises once more and 40°C or more is recorded again in the area to the west of the Arāvallis.

The clear autumn weather following the termination of the monsoon rains in Northern India is accompanied by a rapid fall of temperature in the second half of October—more marked in the minimum than in the maximum. The mean maximum temperature is below  $37^{\circ}\text{C}$  even in North-west India in October, while in November temperatures exceeding  $37^{\circ}\text{C}$  are rare even on individual days in that region. The mean minimum temperature in November is below  $10^{\circ}\text{C}$  in Punjab; and on individual days temperatures below the freezing point may be recorded.

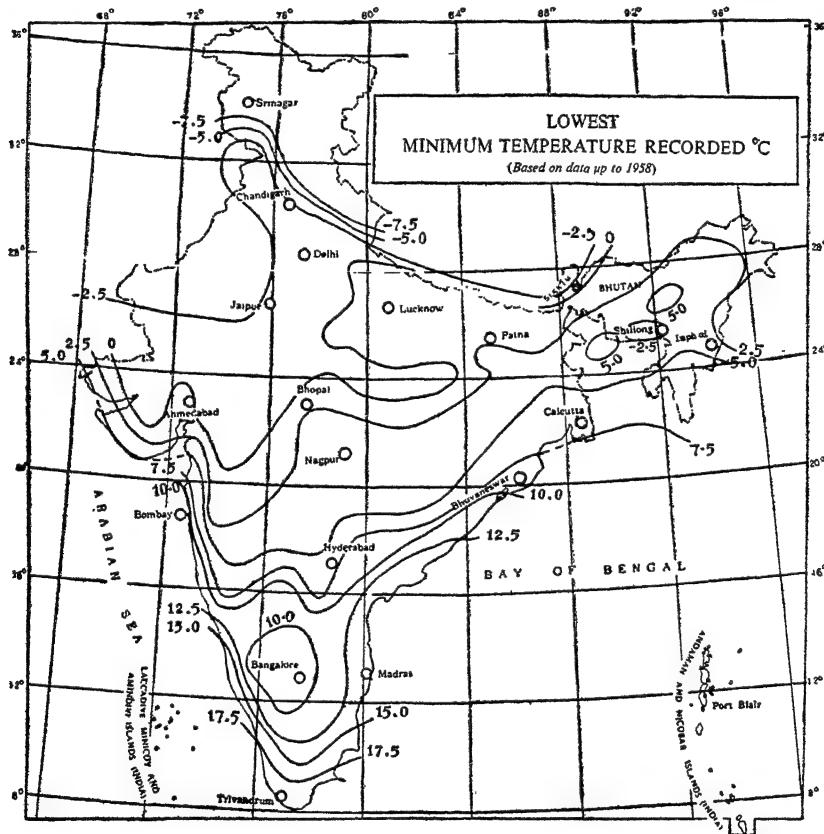


METEOROLOGICAL MAP XII

The distribution of the mean minimum temperature in January and of the lowest minimum recorded in the winter season are shown in Maps XII and XIII respectively, while Maps XIV and XV respectively show the distribution of the mean maximum temperature in May and the highest maximum recorded during the summer season.

In fine, clear weather, temperature changes during the day are strikingly regular in India. The air is coolest shortly before sunrise.

As soon as the sun is above the horizon, temperature Diurnal range begins to rise rapidly, the rate slowing down after of temperature about 9 a.m. until the highest point is reached in the afternoon. Then the temperature begins to fall, slowly at first and more rapidly thereafter. About sunset the fall is as rapid as the rise in the forenoon. The rate is slower after sunset, but the fall continues steadily until the minimum is reached

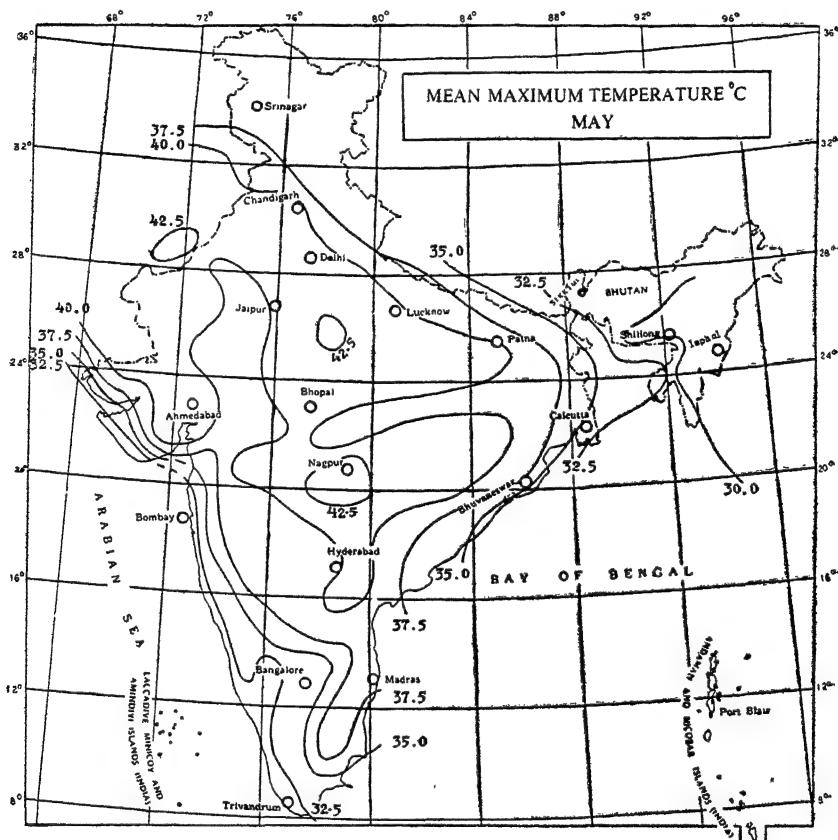


METEOROLOGICAL MAP XIII

a little before sunrise. In coastal regions the rise of temperature during day-time is usually checked with the setting in of sea-breeze shortly after noon.

The range of temperature during the day depends mainly on the humidity of the air and the cloud-coverage of the sky. The range is much greater in the interior of the country, especially

in North-west India, than in coastal tracts. As a general rule, the range is greatest in the driest spring months and least in the rainy season. On the mean of the year, the diurnal range is  $14^{\circ}\text{C}$  to  $17^{\circ}\text{C}$  in North-west India, decreasing towards the east and south. The daily range is  $8^{\circ}\text{C}$  to  $11^{\circ}\text{C}$  in North-east India and in the coastal Districts. Throughout the dry tract to the west of the river Yamuna and the Arāvallis the range of temperature is greatest in October and November, when the diurnal variation is not less

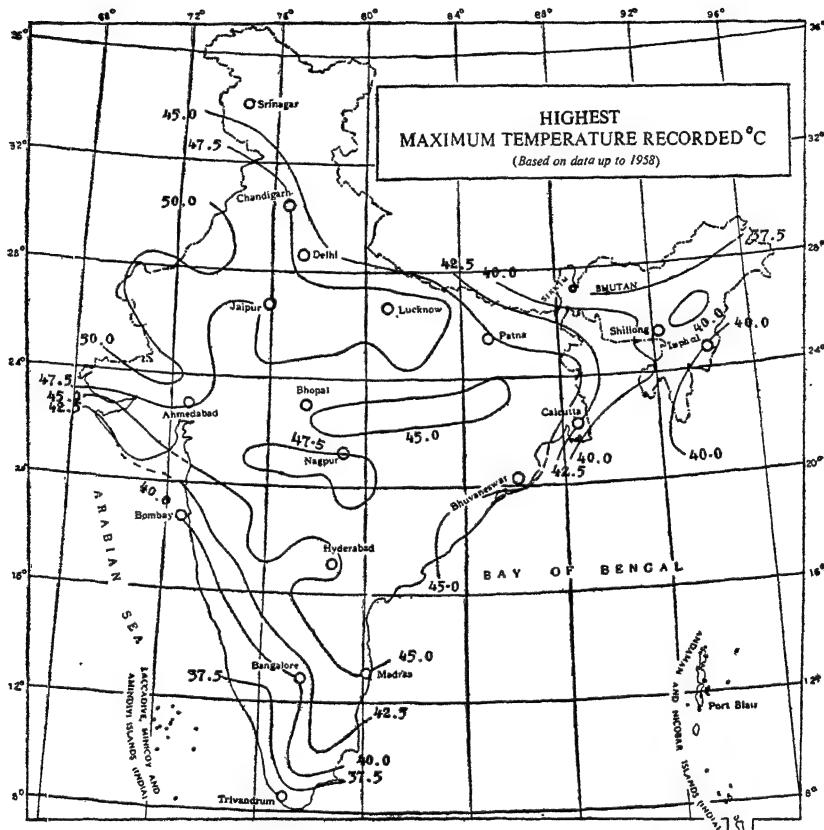


METEOROLOGICAL MAP XIV

than  $17^{\circ}\text{C}$  and increases to  $22^{\circ}\text{C}$  in some places. In the north-west of the Peninsula and the areas adjoining it, the greatest range of  $17^{\circ}\text{C}$  to  $19^{\circ}\text{C}$  occurs in February and March.

In addition to the variety of temperature regions in the plains of India, there is a further variety due to hills. The climate of hill-stations, as health resorts, deserves special attention. These stations are situated along the Himālayas and on the Ghāts in

the Peninsula. Their atmosphere is cooler and damper than that of the neighbouring plains. But while the stations in the Northwest Himalayas are subject to great variations of heat and cold, dryness and dampness, those of Southern India are comparatively equable; their fine clear season is shorter than at the northern stations and far less dry. Table in Appendix B gives the temperatures of a few hill-stations as well as selected stations in the plains.



METEOROLOGICAL MAP XV

The moisture in the atmosphere is obtained by evaporation of water from the earth's surface and from vegetation. Humidity is greatest where winds of oceanic origin especially from the warmer sea areas predominate; it is the least in places where land winds from a colder region hold sway. Distance from the sea and the character of prevailing winds are the main factors which determine the water-

vapour content of air at any place. Humidity is generally lowest in North-west India, and increases towards the sea in all directions.

In the hot weather season, however, the driest air is to be found in the central parts of the country, while in the south-west monsoon months the region east of the Western Ghāts has the lowest vapour pressure. Further, vapour pressure is the lowest over the country generally in December and January when winds of land origin prevail. Humidity begins to increase with the commencement of oceanic winds on the coast, which increase in strength and extend to the interior regions from March to May. The change from local sea-breezes to moist winds of the south-west monsoon brings about a large and rapid increase of absolute humidity over the whole country. In consequence, the spatial variation of vapour pressure is less in July and August than in any other month. The diurnal variation of vapour pressure is generally small in this season.

In the cold weather months, temperature as well as vapour pressure decrease as one passes from the coastal regions to the interior; the variations in relative humidity are smaller in this season than in the hot weather period. The air is driest in the cold weather season in West Deccan, Gujarāt and South-west Rājasthān, with relative humidity between 40 and 50 per cent.

During the hot weather season, the decrease of relative humidity in passing from the coastal areas to the interior Districts is rapid. In this period the air is very dry over the whole of the interior, and particularly in the central parts of the country and the adjacent Deccan plateau, where the mean relative humidity is only about 30 per cent or less. During the hot afternoons of the summer months, relative humidity as low as 5 per cent has been recorded at stations in Upper India, from Punjab to Bihār, and sometimes also in the central parts of the country and North Deccan. Such low values are largely the result of a high degree of turbulent motion in the first kilometre or so of the atmosphere; the air near the ground is replaced by originally colder and drier air of the higher levels, heated up partly on account of its descent and partly by contact with the hot land surface.

In the rainy months of the south-west monsoon season, temperature and the amount of water vapour in the air vary only slightly over most of the country. In this period, air is generally very damp and the relative humidity ranges between 80 and 90 per cent over the greater part of India; only in North-west India it falls below 80 per cent.

The distribution of relative humidity in India in January and July is shown in Maps XVI and XVII. The mean annual

humidity is below 50 per cent in the driest parts of the country, the Thar desert and adjoining areas, and is about 80 per cent in the dampest regions in Assam and along most of the coastline.

Clearly, then, a characteristic feature of the climate over most of the country is the large variability of relative humidity. In a spell of very wet rainy weather the air is sometimes saturated, or

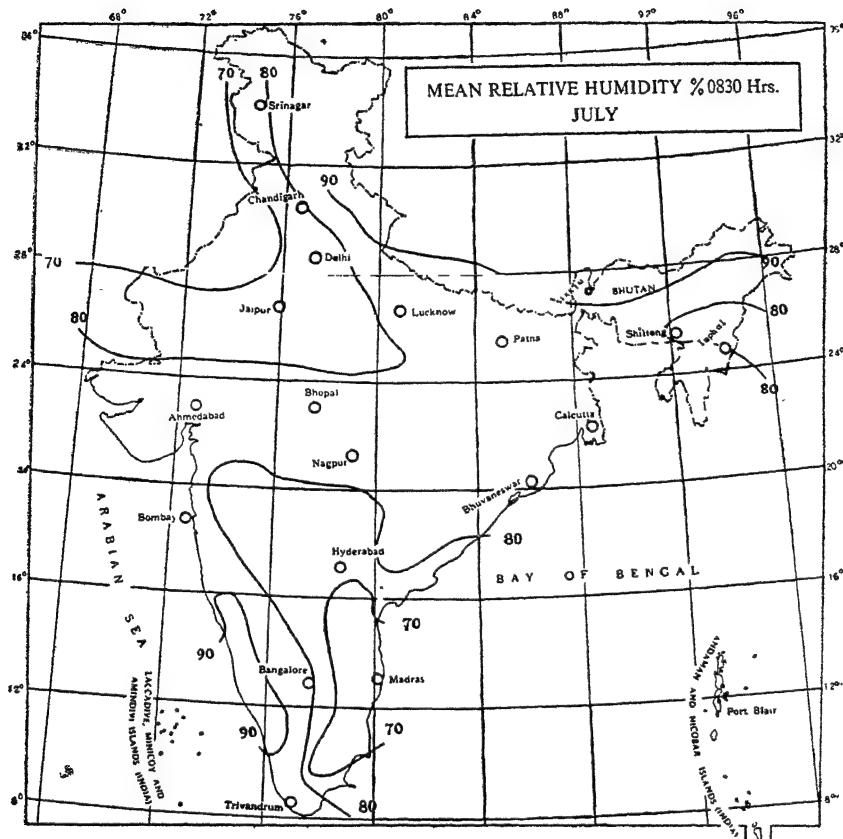


METEOROLOGICAL MAP XVI.

has a relative humidity of 95 to 100 per cent; but when hot winds blow, as in April or May in Upper India, relative humidity is often less than 10 per cent. It varies during the day also; the air is dampest in the early dawn and the relative humidity begins to decrease shortly after sunrise. The driest time of the day is the same as that of the highest temperature, and relative humidity increases in the later hours of the afternoon and evening as the temperature falls.

### 7. Wind Circulation

The main features of the principal wind systems of the north-east and south-west monsoon seasons, as also those of the transition



METEOROLOGICAL MAP XVII

months between the two monsoons, have already been described. The account cannot, however, be adequate without a reference to the upper wind circulation over the region. From observations of the upper winds obtained by pilot balloons over the last 35 years or so, and lately by means of radio wind-finding devices, detailed information has been compiled of the monthly mean direction and velocities of upper winds. The general features of the upper-air circulation up to 3 km. during the four principal seasons are briefly indicated here.

During the winter months, the main features of the wind circulation at a height of 0·5 and 1 km. are : (1) the slow drain of cold air from Irān and Baluchistān towards neighbouring areas in West Pākistān and North-west India, and also along the Himālayas towards the head of the Bay of Bengal ; (2) the curving of the North Indian air around the high-pressure area which extends from Gujarāt to Orissa ; and (3) an easterly to north-easterly current in the south of the Bay of Bengal and the south of the Peninsula.

The prevailing wind direction at 1 km. is from west to north-west and the mean wind speed 15 to 25 km. per hour in the region from Jodhpur to Calcutta. At levels above 1 km. the mean wind direction in Northern India is also from west to north-west, the mean speed increasing with height from 30 to 45 km. per hour. There are two peculiarities of the upper wind distribution in North India during this season. One is the greater tendency of southerly to south-easterly winds to occur in connection with western disturbances in South and East Punjab than at places further south or east ; the other is the occurrence of an easterly flow of air from Assam to Northern Bengal down the Brahmaputra valley.

The winds in the south Bay of Bengal and the south of the Peninsula are generally from the east and have a mean speed of about 25 km. per hour at 1 km. ; there is not much changes of speed with height. As we go northward, north-easterly winds become more and more common on the eastern side of the Peninsula. In the central parts of the country, the wind directions are variable, generally ranging between north-west and north-east in the lower layers with westerlies and north-westerlies becoming more common above 2 km. On the west coast of the Peninsula, to the north of Mangalore, the winds at 1 km. and above become south-east to south.

The main points of difference between wind circulation in the hot season and in the cold season arise from the fact that the anticyclonic high-pressure area over Central India has weakened and is replaced by a cyclonic circulation round a low-pressure area up to 1-km. level. This change, however, takes place without any large alteration in the upper wind circulation above 2 km. The predominant wind directions in Northern India in this season are between west and north-west, but south-westerlies also occur in Rājasthān. From Gaya to Calcutta the winds above 2 km. generally blow from a north-westerly direction, but in the lower levels the directions are mostly south or south-west over Bengal. In the Brahmaputra valley the main directions are from the east as well as from the

west, the easterly being more common from the surface up to 1·5 km. while the westerly is more common at 2 and 3-km. levels.

Winds in Gujarāt and the central parts of the country are also mainly from the west and north-west, but are unsteady in the latter region. In the Peninsula the wind direction undergoes a marked change with height. In the first 1 km. the wind is from a northerly direction along the West Coast, and from a southerly to south-westerly direction along the East Coast; the latter extends into the interior of the Peninsula. At 2 km. the winds are mainly from the east and north-east in the South Peninsula, while in the Deccan plateau the direction is often indefinite. At 3 km. the wind direction is generally from north to north-east over the northern half of the Peninsula and north-east to east in the southern half, the only exception being West Deccan, where southerly winds are frequent.

Wind speeds show an increase with height in Uttar Pradesh and Bihār and in the south of the Peninsula. In Uttar Pradesh and Bihār the mean speeds increase from about 25 km. per hour at 1 km. to 40 km. per hour at 3 km. and in the south of the Peninsula, from about 15 km. per hour at 1 km. to 32 km. per hour at 3 km.

So far as wind circulation is concerned, July may be taken as the representative month of the south-west monsoon season.

Normally, by the beginning of this month, the South-west monsoon season monsoon is established. The wind system is dominated by the low-pressure area over Irān, Baluchistān and Sind, and the low-pressure trough along the Ganga valley. Depressions move more or less regularly in a westerly to north-westerly direction from the head of the Bay of Bengal to West Madhya Pradesh and Gujarāt. Described in general terms, the upper winds are westerly over the whole of the Peninsula, the central parts of the country, and Orissa. But in East Rājasthān, north-easterly winds are also frequent, especially above 1 km. In Punjab the winds are generally from the north-west with occasional changes to south-east.

To the north of the low-pressure trough over the Ganga valley, i.e., over the northern Districts of Uttar Pradesh and Bihār, the winds are generally easterly. In South-west Bengal, south-westerly winds are most common, while in the east and north of this State the main directions are between south and east. The direction of wind in the Brahmaputra valley in Assam depends upon the strength of the monsoon in that area being easterly when the monsoon is weak and westerly when it is strong.

In this season there is great steadiness in wind direction over most of the area. The largest variation occurs in the neighbourhood of the low-pressure trough in the Ganga valley and in South-east Punjab, mainly due to the passage of monsoon depressions over this region.

The mean wind speeds, irrespective of direction, are lowest in Punjab—15 to 25 km. per hour. They are highest in the Peninsula, the mean values ranging from 30 to 70 km. per hour. The maximum speed occurs at about 1·5-km. level.

As the monsoon withdraws from most of the country in October, an anticyclone is established over the regions close to the Himālayas. In the south of the Peninsula and in the south Bay of Bengal, the westerly to south-westerly winds of June to September weaken and become variable in October, while in November north-westerly rain-bearing winds become active.

Over the greater part of the Northern Indian plains, the winds are mainly north-westerly, except that in East Rājasthān northerly to north-easterly winds are also fairly frequent. In Assam and Northern Bengal the easterly valley winds characteristic of winter and early summer blow down the Brahmaputra valley. Over Northern India, the mean speeds irrespective of direction are 15 to 35 km. per hour in the first 2 km. and 30 to 40 km. per hour at 3 km. In the north of the Peninsula, the principal wind direction is from north-west and north, and in the middle and south of the Peninsula from north-east to east. Westerly winds occur sometimes in the extreme south in October. The mean wind speeds are 12 to 25 km. per hour in the north of the Peninsula and 24 to 40 km. per hour in the south.

The seasonal winds as described in this and the previous sections give an idea of the wind circulation from the surface upwards. Variations in these more or less steady features are caused (1) by the daily alternation of land and sea-breezes on and near the coastal belts and (2) by the occasional marked changes in the winds in association with the passage of cyclonic storms, depressions and marked low-pressure areas.

On clear hot days, daily movements of the surface wind take place near the coasts. This is somewhat analogous to the changes of monsoon winds, but of far less strength and extent. Sea-breeze blows from the colder sea to the warm land by day and land-breeze from the cold land to the warmer sea at night. Sea-breeze, when well developed, may reach a height of 1 km. or more and extend 50 to 100 km. inland with a velocity of 25 to 35 km. per hour; it usually attains its maximum intensity between 3 and 5 p.m.

Retreating  
south-west  
monsoon

Land-breeze, on the other hand, seldom extends more than 15 km. seawards and its height and velocity also are correspondingly less.

Land and sea-breezes are most marked along the coastal belts of India during the clear and sunny days of the dry season, particularly on occasions when the pressure-gradient is weak and ill-defined. They are the least pronounced, sometimes even non-existent, during the wet monsoon season when generally cloudy conditions prevent the land surface from heating up at day-time or cooling by radiation at night, and when the steadier and stronger seasonal winds overcome the daily reversal of the conditions over land and sea. On the less rainy east coast of India, however, sea-breeze often sets in even in the monsoon season towards the evenings, with a sudden fall of temperature.

Local variations in seasonal wind circulation are also brought about by somewhat well-defined mountain and valley winds. In hilly and rugged country-side there is an air movement up the valleys during day-time, and a more marked flow of air down the valleys at night; these are particularly well marked at times when the general wind is light or calm. In such instances, the contour of the land plays a very important part. If the valley is long and fairly steep, and particularly if it acts as a drainage channel for a gently sloping wider plateau, the down-flowing mountain wind may assume the speed of a gale.

The pressure systems, cyclonic depressions or storms, which affect the weather over India in different seasons, have already been mentioned. The principal among these are the depressions travelling mainly across Northern India from west to east during the winter season, generally known as the western disturbance: the depressions originating at the head of the Bay of Bengal moving west or north-westwards along the trough of low-pressure over the Ganga plain in the south-west monsoon season, and the cyclones which form in the Bay of Bengal or the Arabian Sea and move inland, causing heavy rain and strong gales during the April-May and October-December transition seasons.

At a time when the general meteorology of India was little known, Henry Piddington laid the foundations of the knowledge of the storms of the Indian seas and introduced the word "cyclone" to designate them. In these storms the air moves in converging spirals in a direction against the hands of a clock. The winds become stronger and fiercer as the centre is approached and reach hurricane force near it. In the innermost central zone of some 15 to 30 km. diameter, known as the "Eye of the cyclone", the wind suddenly falls off to light puffs of air. Beyond the centre the hurricane resumes its force but its direction is now reversed.

It falls off gradually as the centre moves away. Cyclones die down soon after they reach land. But in coastal Districts they may cause great havoc. Lowlying Districts may be hit by destructive storm waves and huge masses of sea-water swept forward. When aided by a high tide, these inundate lowlying land to a depth of 5 to 7 metres.

Cyclones and cyclonic depressions carry their own well-defined wind systems around them, within their fields of influence, and cause temporary but well marked changes in the normal wind circulation over the places they visit in the course of their life-history.

### *8. General Summary of India's Climates*

This section summarizes the broad climatological features of the five climatic regions of India for each of the four seasons : winter (December to February), summer (March to May), rainy season (June to September), and autumn (October and November). In this account the term "rainy day" has been used, in accordance with the convention adopted in India, to denote a day in which 2·5 mm. or more of rain is recorded. This summary is supplemented by the Table in Appendix B which gives the temperature and rainfall data for 30 selected stations in the plains of India and similar data for 10 selected hill-stations and brings out the climatic features of the regions represented by the stations.

#### *North-west India comprising West Rājasthān, Punjab and Kashmīr*

*Winter* :—Western disturbances frequently affect the weather of this region in the cold season. On an average, six disturbances pass eastwards each month, but not all are active. They begin to get active from about the middle of December, remaining for a day or two over Punjab and, sometimes, concentrating there. In front of these disturbances, strong southerly to south-easterly winds with poor visibility blow over the Eastern Punjab hills. These disturbances are sometimes associated with well marked cold fronts; cold waves follow in their wake with strong northerly to north-westerly winds lasting for a day or two and causing frost. The cold waves sometimes extend as far as the northern Districts of the Deccan plateau.

Winter precipitation begins on the mountains in the second half of December and its frequency increases in the Himālayas

and the adjoining plains with the progress of the season. Rain falls only occasionally in Rājasthān. Thunderstorms occur in the later half of the season, mostly in the hills and the adjoining plains. In the southern divisions thunderstorms are less common, but dust-storms occur occasionally.

*Summer* :—This is a season of gusty afternoon winds and convective phenomena like dust-devils, dust-storms and thunderstorms. Western disturbances continue to travel across the region eastwards, the cold fronts in their rear being generally associated with dust-storms or dry thunderstorms. Charged with dust, the atmosphere becomes hazy. Occasionally, in May and June, after extensive dust-storms in the west, the air over East and North Punjab and in Uttar Pradesh becomes charged with fine dust which reduces visibility considerably; this dust-haze often extends to heights of over 3 km.

Rainfall is rare in the plains in April and May. In June it occurs intermittently in West Rājasthān and East and North Punjab, especially near the hills. Kashmīr has more rain in April than in May and June. This is the season of dust-storms and thunderstorms; earlier in the season they are attended with little rain; but the associated rainfall increases as the season advances.

*Rainy season* :—The monsoon extends to Eastern Punjab in the last week of June or first week of July, the moist winds withdrawing from the region early in September. Dry cloudless weather is succeeded by days of convective clouds, followed again by cloudless skies. In West Rājasthān the rains come in the third or fourth week of June and cause a marked lowering of temperature. This is usually associated with depressions from the head of the Bay of Bengal. In East and North Punjab the rainy season covers the period between the last week of June and mid-September; days of sultry heat are interrupted by cooler days of south-easterly wind and thunder-showers.

The amount as well as frequency of rainfall is greatest on and near the hills. Rainy days in each of the months of July and August average 7 to 8 in Kashmīr and East and North Punjab, and 4 to 5 in West Rājasthān; there is a general decrease in September. Thunderstorms are common in Kashmīr, East and North Punjab, and the neighbourhood of the Arāvalli hills.

*Autumn* :—This is a season of clear skies with good visibility. Occasionally, western disturbances cause clouding in Kashmīr and the Punjab Himālayās. Rain is scarce. A few days of thunder may be experienced in East and North Punjab and near the Arāvalli hills.

*Northern Plains comprising Gujarāt, East Rājasthān, Madhya Pradesh, Uttar Pradesh and Bihār*

*Winter*:—December to February is a season of clear, bright weather interrupted by cloudy spells; these are caused by the passage of western disturbances—six each month on the average—which bring more cloud and rain to West Uttar Pradesh than to the rest of the region. Warm, close weather with southerly winds precedes the disturbances. This is followed by rain in the east and north of the depression; snow-fall occurs on the Himālayas. In the wake of the depressions, pressure rises rapidly and there is clear weather again.

In this season rain occurs on 4 or 5 days in West Uttar Pradesh and from 1 to 3 days elsewhere. Gujarāt is the driest area and December the driest month. Dust-storms are rare in this season, while thunderstorms occur only on 1 or 2 days in each of the months of January and February, associated with cold fronts in the rear of passing western disturbances.

*Summer*:—Weather is generally fair with only occasional western disturbances which are more active in the earlier part of the season. This is the time of convective phenomena like dust-storms, thunderstorms and hail. Haze in the atmosphere increases with the advance of the season. Moderate to strong westerly dry land winds prevail, especially in March and April.

Thunderstorms and dust-storms increase in frequency with the progress of the season, their maximum frequency being in West Uttar Pradesh and in the Kumaun hills. Rain falls only on 1 or 2 days in each of the months, the frequency being higher in Bihār.

*Rainy season*:—The monsoon advances into this region about the third week of June, generally preceded by thunderstorms and dust-storms, particularly in East Rājasthān and West Uttar Pradesh. It withdraws from Gujarāt, Madhya Pradesh and Uttar Pradesh by the third week of September, and from Bihār by the end of that month or early October. The monsoon is most active in this region in July and August, when depressions from the head of the Bay of Bengal travel west or west-northwestwards bringing heavy rain to the central parts of the country and sometimes to Gujarāt.

In July and August, 10 to 15 rainy days may be experienced, while there are only 5 to 9 days in June and September. Rainfall increases towards the south-east in Gujarāt and East Rājasthān, while in Uttar Pradesh and Bihār plains it increases both towards the Himālayas in the north and the Central Indian hills in the

south. Thunder is heard frequently in July and August, but is usually unaccompanied by strong winds.

*Autumn* :—After the withdrawal of the monsoon, clear bright weather prevails during the season. Only occasionally, storms from the Bay entering West Bengal cause disturbed weather in South-east Bihār; remnants of storms from the Arabian Sea, which cross the coast north of Bombay, disturb the weather in Gujarāt and Madhya Pradesh.

*North-east India comprising West Bengal, Orissa and Assam*

*Winter* :—Light, north-easterly winds blow down the Brahmaputra and Cāchār valleys in Assam and light northerly to north-westerly winds over the rest of the region. Weather is occasionally changed by the passage of western disturbances across the region; light rainfall occurs in January and February along the hills, increasing towards North-east Assam.

The number of rainy days increases from December to February. Thunderstorms are rare in December and January and occur only on 1 or 2 days in February; these may occasionally be accompanied by dust-storm or hail.

*Summer* :—In this season North-east India is under the sway of three air streams—a deep north-westerly current from Uttar Pradesh and Bihār, a shallow southerly stream from the head of the Bay of Bengal over the Orissa and Bengal coasts, and a shallower current of north-easterly to easterly winds from the Brahmaputra valley blowing over the plains of Northern Bengal and Bihār. With the interactions between these air streams, this is a season when marked instability develops in the atmosphere and severe thunderstorms occur extensively, sometimes preceded by dust-raising squalls. Occasionally, in April and May, hot westerly to north-westerly winds blow for a day or two over Southern Bengal.

Rainfall increases both in amount and frequency as the season advances, being generally associated with afternoon or evening thunderstorms and squalls. They are generally more concentrated in the southern Districts of the region and in Upper Assam. Hailstorms occur on 1 to 3 days in the season, especially in Orissa and South-west Bengal and on the Assam hills.

*Rainy season* :—The monsoon advances into West Bengal in the last week of May or in early June, being usually ushered in by a depression in the Bay of Bengal. Subsequently, a series of these depressions, forming at the head of the Bay and moving inland,

give spells of continuous and moderate to heavy rain generally over the region. The monsoon withdraws from North-east India in the last week of September or the first week of October.

July and August are the雨iest months. Rain is most frequent and heavy on the southern slopes of the Khāsi hills in the north-east corner of Assam and in Northern Bengal. Much of the rainfall in June and September is associated with thunder-clouds, while thundery weather is less frequent in July and August.

*Autumn* :—After the withdrawal of the monsoon winds, light unsteady winds are experienced by the middle of October. Thereafter in November the winds are north-westerly from the Ganga valley or north-easterly from the Silchar and Brahmaputra valleys. Occasionally in October cyclonic storms from the Bay cross the Bengal coast and bring cloud and rain with them.

There are about 5 to 7 days of rain in this region in October; this goes down to 1 or 2 days in November. The rainfall is more in Southern Bengal and in the north-eastern divisions of the region. Almost all the rain in this season is associated with thunder; Orissa and the hilly Districts of Chota Nāgpur are the most liable to experience thundery weather.

#### *The Plateau Region comprising the Deccan Plateau, Vidarbha and Chota Nāgpur*

*Winter* :—December to February is a season of clear, bright weather in the plateau region of the Indian area. In December, an occasional incursion of the moist easterly winds may cause cloudy skies and light showers in the southern regions of the Deccan plateau, while in January and February western disturbances sometimes cause cloud and rain in the Central Indian plateau and in Chota Nāgpur.

In the northern parts of the region rain may occur on 4 days in the season—mainly in January and February—while in the southern divisions one day of rainfall in December is the average. There are occasional thunderstorms in association with the western disturbances, which may sometimes be accompanied by hail, the number of thunderstorms increasing with the progress of the season.

*Summer* :—This is a season of increasing temperature and increasing humidity in the central parts of the country. In March the western disturbances take a more northerly track; still, some of them cause cloudy and rainy weather in the central plateau region. Thunderstorm and rain occur in Mysore. Cyclonic

storms from the Bay of Bengal or Arabian Sea cause disturbed weather in the south of the Peninsula.

Rainfall increases as we go eastwards towards Chota Nāgpur and south towards South-west Mysore, which have the greater frequency of thundery days in this region as the season advances.

*Rainy season* :—From the beginning of the monsoon to the end of August, rainfall decreases as one proceeds eastwards from the Western Ghāts; it decreases from 250-375 cm. to 50-60 cm. within 50 or 60 km. of the crests of the Ghāts. The driest part of the Deccan strip in this season is an area stretching north to south parallel to the Western Ghāts and 80-125 km. east of them, from the foot of the Sātpura hills to almost the foot of the Nilgiri hills. In September the plateau region east of the Western Ghāts gets some heavy thunder-showers in association with dissipating low-pressure systems which move westwards across the Peninsula.

The southern divisions of Madhya Pradesh, Vidarbha and Chota Nāgpur form the area of maximum rainfall, with an average of about 115 cm. in 50 rainy days. The Deccan plateau gets 40-50 cm. in 25 to 35 rainy days. In the Mysore plateau the number of days with rain is larger but the amount of rain is smaller. Thunderstorms with dust-raising squalls occur on a few days before the advent of the monsoon; there are 6 to 12 days of thunderstorm in the season in Vidarbha and Chota Nāgpur.

*Autumn* :—This is a period of transition from the rainy season to winter with rapidly clearing skies in the northern divisions. In the south the retreating monsoon continues to give rain in and around the Mysore plateau in October and to a lesser extent in November. Occasional storms from the Bay of Bengal in November cause stormy weather and widespread rain in the Deccan. Most of the rain in the interior of the Peninsula is accompanied by thunder.

#### *The Peninsula comprising Coastlands and Plains*

*Winter* :—Up to the middle of December the north-east monsoon continues to give rain in the south of the Peninsula. Then the moist winds retreat southwards and the whole region is filled with dry air from the north. Occasionally, in December, cyclonic storms from the south of the Bay of Bengal travel towards the Coromandel Coast causing high winds and locally heavy rain. The rest of the period is a season of clear, bright weather with cool nights and morning mist or fog near the coast and in the valleys.

Rainfall is rare in January and February. Throughout the season there may be 1 or 2 days of thunder in each month in the south of the Peninsula.

*Summer* :—With a steady increase of temperature and humidity, afternoon thunderstorms become more and more common on the West Coast, especially in Kerala. In the last ten days of May, an advance of the monsoon in Kerala may take place. It is associated with a depression or cyclonic storm, and on rare occasions a storm from the Bay of Bengal causes severe weather with gales and heavy rain near the Coromandel Coast.

Rain is usually associated with thunder and increases with the advance of the season. South Kerala and the neighbouring hills get the maximum rain, the thundery weather of April and May being short-lived local squalls.

*Rainy season* :—The monsoon begins in Kerala early in June, reaching Bombay during the first week. At the time of the advance of the monsoon, and also when diffuse low-pressure areas from the Bay of Bengal move westwards across the Peninsula in September, the Andhra coast sometimes gets heavy showers. The interior of the Peninsula, especially the south-eastern Districts, gets thunder-showers when the monsoon current is generally weak, and also when weak depressions move westwards across the north of the Peninsula in September.

Rainfall is heavy on the West Coast, increasing to a maximum on the crests of the Western Ghāts and decreasing rapidly on the eastern side. The monsoon rainfall on the western side of the Ghāts is 380-500 cm. while about 70 km. to its east it is only 50-65 cm. on the average. The rainfall on the West Coast decreases rapidly north of Surat and south of Trivandrum, and the south-eastern Districts of the Peninsula get only a few days of rain. When the monsoon is established, thunder is rare on the West Coast; it occurs, however, in Kerala when the monsoon current is weak.

*Autumn* :—October and November are the cyclone months in the Bay of Bengal and the Arabian Sea. Associated with these cyclones, October to mid-December is the main rainfall season in South-east Madras.

A few thunder-showers occur on the Konkan coast; elsewhere, they are fairly frequent in October and somewhat less so in November.

## WEATHER AND CLIMATE

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## CHAPTER III

### GEOLOGY

#### 1. *Evolution of the Indian Subcontinent*

THE OUTSTANDING FACT about the physical geography and geology of India, which is the result of its past geological history, is that in the making of the Indian subcontinent, three distinct crust-blocks of the earth's circumference have taken part. These are : (1) the Deccan peninsula south of the Vindhyan mountains, a solid and stable crust-block composed of some of the most ancient rocks of the earth's crust; (2) the great mountain ranges to its west, north and east composed of folded and crumpled sedimentary rocks building the extra-Peninsular portion of India; and (3) the Indo-Ganga plains separating the two former areas and extending from the Indus in Sind through the Punjab plains to the Brahmaputra in Assam. This part of India, structurally, is regarded as only the buckled, downwarped portion of the Deccan block.

Three constituent crust-blocks

In their characters and peculiarities as earth features, the two segments of India—Peninsular and extra-Peninsular—are entirely unlike each other. The first difference is stratigraphic, or that connected with the geological history of the areas. Ever since the dawn of geological history (Cambrian period), the Peninsula has been a bare land area, a continental fragment of the earth's surface; since that early period it has never been submerged beneath the sea except temporarily and locally. The extra-Peninsula, on the other hand, has been a region which had lain under the sea for the greater part of its history and has been covered by successive marine deposits characteristic of the great geological periods commencing with the Cambrian. The second difference relates to the geological structure of the two regions. The Peninsular part of India reveals a type of architecture of the earth's crust quite different from that shown by the Himālayas and the other mountain ranges of the extra-Peninsula. It is a segment of the earth's outer shell that stands upon a firm and immovable foundation, and that has for an immense interval of geologic time remained so, impassive amid all the revolutions that have again and again changed the face of the

## THE GAZETTEER OF INDIA

earth. Lateral thrusts and mountain-building forces, since early pre-Cambrian times, have had but little effect in folding or displacing its original horizontal structure.

The extra-Peninsula, on the contrary, is a portion of what appears to have been a comparatively weak and flexible part of the earth's crust which has undergone a great deal of crumpling, folding and deformation. It has undergone, at a very late geological epoch, an enormous amount of compression and mountain-building upheaval. The third difference is in the diversity of the physical features—physiography—of the two areas. In the Peninsula, the external or surface relief, its hills and mountains, are mostly of the "relict" type; that is, they are not mountains of uplift, but are mere outstanding portions of the old plateau of the Deccan that have escaped the weathering of ages which cut out all the surrounding part of the land. Its rivers denuding their beds for long geological ages have flat, shallow valleys with low gradients, the channels having approached the base-level of erosion. Contrasted with these, the mountains of the extra-Peninsula are all true tectonic; that is, they owe their origin to a distinct uplift of the earth's crust. The rivers of this area are rapid torrential streams which are still in a very youthful or immature stage of development; they are continuously at work in degrading or lowering their channels and cutting deep gorges, hundreds of metres in depth, through the mountain part of their track.

The third division of India, the great alluvial plains of the Indus and the Ganga, though of the greatest importance as the main theatre of Indian history, is geologically the least interesting part. These plains are only the alluvial deposits of the rivers of the Indus, Ganga and Brahmaputra systems, borne down from the Himālayas and filling up a deep depression several hundred metres deep.

How these crust-blocks came to be together to build the geographic entity we call India is one of the puzzles of geology.

Fusion of the three blocks One school of geologists denies the Asiatic parentage of India. It suggests that the Indian and Arabian peninsulas of Asia were parts of an ancient, far-away, southern continent beyond the Equator, of which Africa and Australia are the surviving remnants. The impact of these drifting fragments of the southern continent with the southern shores of the block of Eurasia is held to have ridged up its geosynclinal sea-floor into the imposing chain of mountains which girdles India's Asiatic front.

The orthodox school of geologists finds no adequate force or agency in the earth's body to effect a congregation of continents

into one mass and their subsequent fragmentation and drifting away across the oceans. They are inclined to believe in the permanence of all the continents and ocean basins of the earth since the beginning, with only subordinate movements of elevation and depression on lateral shift. According to these geologists, the making of India has been an evolutionary process. The two component crust-blocks were integral and adjacent parts, though each pursued a distinct geological course of events; one was a stable land-mass composed of ancient crystalline rocks and never, since the end of the earliest era of geology, submerged underneath the ocean; the other was a flexible and comparatively weak belt of the earth's circumference which was again and again submerged under sea-water and covered with hundreds of metres of marine sediments. The ridging up of the sedimentary pile from the sea-bottom into the great mountain wall of India is explained as due to tangential pressures which acted on this overloaded and consequently weakened zone of the crust, lying as in a vice between High Asia and the Deccan block. In contrast with the stable rocks of the Deccan block which have remained unfolded, the Himalayan segment of India has undergone colossal flexuring, thrusting and compression. During these earth plications, masses of igneous plutonic rocks, granites from the depths of the earth, have been pushed up through the sedimentary cover and now build the central zone of highest elevation of the Himalayas, from the snow-capped peak of Everest to Nanga Parbat on the Indus.

The Table, on pp. 119-120, gives the main outlines of the succession of rock-systems in the two divisions of India, arranged in the order of date and referred to the standard divisions of the geological time-scale accepted by the world. It gives also in a systematic chronological order the succession of the geological formations found in different parts of India, commencing with the oldest. The Indian Geological Survey have classified the rock-systems of India from the earliest records into four great groups : *Archaeon*, *Purāna*, *Dravidian* and *Aryan*. These do not all correspond to the four divisions of European standard geological scale—*Archaeon*, *Palaeozoic*, *Mesozoic* and *Cainozoic*—but are well adapted for a comprehensive grouping of the rock-systems of the Deccan, by reason of their character and peculiarities. It is only in the Himalayan region that a classification of rock-systems in terms of the European sequence can be established beyond doubt. The respective limits of the four main divisions in terms of European and standard geological time-scale are : the *Archaeon* of India

Table of  
geological  
systems

practically corresponding to the European Archaean ; the *Purāna* era roughly corresponding to Algonian and representing the rock-records of several hundred million years from the end of the Archaean to the commencement of the Cambrian; the name *Dravidian* is given to the rock-systems commencing from the Cambrian to the Middle Carboniferous; and the *Aryan* era which follows corresponds with the long sequence of systems beginning with the Upper Carboniferous, through the Mesozoic and Tertiary, to the Pleistocene. In the Table, the subdivisions of these groups as developed in the various parts of the country are shown with their approximate correlations to the standard stratigraphic scale of the world.

The following pages give a brief review of the successive rock-formations representative of the various geological periods found in India; it takes into account their chief rock components, their fossil contents, the geographical revolutions that happened during the ages, and the important economic mineral resources associated with the various systems of strata.

## 2. *The Archaean Era*

*Archaean* is the name given to the oldest rock-system in the world, forming the very basement on which all the succeeding divisions of the geological column rest. To these fundamental basement rocks of India composed of gneisses, schists and crystalline metamorphosed rocks, Sir Thomas Holland gave the name, *Vedic system*. This name, however, has not found acceptance in world geological terminology.

The Archaean rocks of India, in part at least, represent the first formed crust of the earth. They are also believed to be the earliest sediments, formed under conditions of the atmosphere and the oceans quite different from those existing at later dates, and subjected to an extreme degree of thermal and regional metamorphism. A large part of the Archaeans is believed to be highly metamorphosed and deformed igneous rock-masses under great earth-movements and stresses. The Archaean rocks cover approximately 2 million sq. km. of the surface of India in Madras, Mysore, Andhra Pradesh, Orissa, Madhya Pradesh, Chota Nāgpur and Rājasthān. They extend north-westwards along the chain of the Arāvallis, one of the oldest mountain ranges in the world, while they build a considerable though yet undetermined extent of the inner snow-covered ranges of the Himālayas from Kashmīr to

Sikkim. To the north-east, they extend from Bihār to the Assam plateau.

These rocks are thoroughly azoic, devoid of any vestiges of life. They are largely a mixture of gneisses, granites and schists, all thoroughly crystalline, and permeated by injections of igneous magma from the deeper plutonic parts of the subcrust. With these once molten crystalline rocks are associated clastic sediments which have undergone an extreme degree of metamorphism due to their subjection to the heat and pressure of the earth's interior. To this part of the Archaean complex, the name of *Dhārwār system* has been given. Due to the greater interest of these sedimentary Archaeans and the mineral and ore deposits associated with them, the Dhārwārs have received much study and attention from geologists. Owing to the widely divergent conditions under which these rocks were formed and their subjection to successive orogenic periods during the whole vista of geological time, now reckoned about 3,000 million years, the Archaean basement rocks everywhere possess an extreme complexity of character, and relations which have not yet been completely resolved.

Though of the same age, and probably in some parts older than the associated Archaean gneisses and granites, the Dhārwār system of rocks is designated under a different name because of their special interest in Indian geology.

The Dhārwār system These sedimentary strata appear to rest over the gneisses at some places with unconformity, while at others they are largely interbedded and interfolded with them. Although of undoubtedly sedimentary origin, the Dhārwārs are altogether unfossiliferous, a circumstance to be explained as much by their extreme antiquity, when no organic creatures inhabited the earth, as by the great degree of mechanical alterations and deformations they have undergone. These circumstances have led to the sedimentary nature of the Dhārwār rocks of several areas, notably in Mysore, being doubted by some geologists; they regard the bedded schists, limestones and conglomerates as of igneous origin. Field-work in Mysore, however, has clearly established the sedimentary nature of many terrains of Dhārwār rocks without any doubt. The main areas of Dhārwār rocks in India are southern Deccan, including the type area of Dhārwār and Mysore State, Karnātak, Chota Nāgpur, Jabalpur, Rewa, Hazāribāgh, Shillong plateau, and the Arāvalli region in Rājasthān extending as far north as Jaipur. In the Himālayas, the Dhārwār system is well represented in the central and northern ranges.

This system is very well developed in the Karnātak region and covers a large area there. The types of rocks found are

volcanic acid and basic lava-flows and tuffs, crystalline schists and granites containing kyanite, graphite, garnet and corundum, together with metamorphosed sediments with conglomerates, phyllites, limestones, and basic and ultra-basic intrusives.

Homotaxial series of rocks developed in Rājasthān are known under the name of the *Arāvalli system*—they build the Arāvalli range, the most ancient mountain chain of India. Since then, the Arāvalli mountains have remained one of India's principal physical features. By their meteoric denudation they have contributed sediments to many subsequent geological systems. There is evidence that this mountain chain has received renewed post-Dhārwār upheavals. It is a closely plicated synclinorium of Dhārwār schists, quartzites, phyllites and slates together with composite gneisses, aggregating over 3,000 metres in vertical extent. The degree of metamorphism shown by these rocks is highly variable and there are exposures of almost unaltered Archaean slates in one part of the outcrop and highly altered hornblende-schists and schistose conglomerates in another. The outliers of the Arāvalli system are found as far south as Baroda in Gujarāt (*Chāmpāner series*).

Dhārwār rocks cover large connected areas in Madhya Pradesh, extending over to Bihār. In these areas, the system possesses a highly characteristic metalliferous facies of deposits which have attracted much attention on account of the ores of manganese and iron associated with it. The rocks are granulites, dolomite marble with mica, sillimanite, and hornblende-schists, in the Nāgpur and adjoining Districts (*Sausar series*). An upward extension of the Sausar series containing chlorite schists, jaspilites and haematic quartzites is known as the *Sakoli series*. The famous "marble rocks" developed in the Narmada gorge belong to this system. In some parts of Madhya Pradesh, these rocks are distinguished by a richly manganeseiferous facies containing workable deposits of manganese-ores (*Gondite series*). Gondite rocks are found typically in the Bālāghāt and Nāgpur Districts as well as in the extension of these rocks in the old Bombay State and in Rājasthān. A similar series of manganeseiferous rocks found in the Vishākhapatnam area of Andhra, consisting mostly of manganeseiferous sediments, metamorphosed by plutonic intrusives into hybrid crystalline rocks, is known as the *Kodurite series*.

The next important development is seen in Singhbhūm and Orissa. This area contains the well known mica fields of North India, in the Rānchi, Hazāribāgh and Gaya Districts. A geologically interesting development of the system is seen in South Bihār,

Singhbhūm, Gāngpur and Mayūrbhanj areas in enclosing thick masses of richly ferruginous sediments (*Iron-ore series*). The Iron-ore series carries interbedded iron-ores of large dimensions, estimated to yield 8,000 million tonnes of high grade haematitic iron-ores. The question of the ultimate source of the iron-oxides and the exact processes which segregated them here on such a scale have been discussed by Indian geologists and they ascribe it variously to marine chemical precipitation, sedimentary deposition and metasomatic replacement of pre-existing sediments in a period of marked volcanic activity. The *Khondalite series*, a group of sillimanite-graphite schists, is of wide prevalence in Dhārwār areas.

Dhārwār rocks of the Himālayas are found in Kashmīr, Garhwāl and in the Nepāl-Sikkim areas, where they are recognized by the name of *Salkhala series*, *Vaikrita series*, *Jutogh series* and *Daling series* respectively.

The Dhārwār system, containing many of the principal mineral and ore deposits of the country, is of great economic importance. It carries the principal ore deposits of gold, manganese, iron, chromium, copper, beryllium, uranium, thorium and titanium. The Kolar gold-reefs produce over 7,100 kg. of gold annually; about 6 million tonnes of high quality iron-ore, over a million tonnes of manganese-ore, 100,000 tonnes of chromite and smaller quantities of copper are also produced every year. Lead and zinc are other minor products of this rock-system. The strategic atomic metal, thorium, occurs in the widely distributed mineral monazite. To the same system belong such industrial minerals as mica, corundum, graphite, precious and semi-precious stones, ilmenite, kyanite and columbite, which bring an annual revenue of several crores of rupees. The system is also rich in resources of monumental building stones—granites and marbles, for instance. These were the materials for the finest specimens of ancient Indian architecture, such as the South Indian temples and the Tāj Mahal at Agra. Extensive spreads of heavy mineral sands on the Malabār and Coromandel Coasts—the source of valuable, rare compounds, monazite, ilmenite, rutile, zircon—are derived from the weathering of Dhārwār rocks.

#### Economic importance of the Dhārwār system

### 3. *The Purāna Era*

After the termination of the Archaean era of geology, a long interval of unrecorded ages followed. In that period, earth-

movements on a very extensive scale folded the Dhārwār sediments into complicated mountain ranges, which were subsequently worn down to the base-level. It is over the deeply chaean interval denuded edges of the Dhārwār rocks that the basement of succeeding rock-formations rests.

These formations, known in Indian geology as the Purāna group, succeeded the Archaean-Dhārwār after an immense lapse of geological time, representative of many cycles of mountain-uplift and their complete weathering and erosion to the roots. The Purāna division is of great thickness, over 9,000 metres, consisting of wholly unfossiliferous slates, quartzites, sandstones and limestones, found developed in Rājasthān, the Cuddapah area of Madras, Andhra Pradesh and some Districts in Central India. Being of pre-Cambrian age, these rocks are still devoid of any identifiable forms of life preserved in them. The older subdivision of this group of rocks, the *Cuddapah system*, shows a much greater amount of structural deformation and metamorphism than the younger subdivision, the overlying Vindhyan group, which shows hardly any disturbance from its original horizontal stratification. As stated before, the Deccan plateau of India since the Dhārwār period has not undergone any orogenic mountain-building movement, or submergence under the sea.

Rocks of the Cuddapah group occupy large areas in the Cuddapah District of Andhra Pradesh and Chhattīsgarh in Madhya Pradesh. They are recognized in different parts of the country under the names *Bijawar series*, *Gwalior series*, *Cheyair series* and others. Some dykes of basic lavas penetrating the Bijawar series are believed to be the parent rocks of the famous "Golconda" diamonds. The *Kaladgi series* occurs in the country between Belgaum and Bijapur, carrying some workable ores of iron. Other representatives of the Cuddapah are the *Kistna series* in the Krishna valley, *Pakhal series* in the Godāvari valley, and the *Raipur series* of Chhattīsgarh.

Rocks belonging to the *Delhi group* are of the same age as the Cuddapahs, though much more severely disturbed and folded, because of their involvement in Arāvalli orogeny. They occupy, besides the type area, wide areas in North-east Rājasthān, extending upto Delhi and forming prominent ridges there—hence they are known by this name. From Idar to Delhi they form narrow, constricted, eroded bands known as *Alwar* quartzites. These rocks have acquired a higher metamorphism also because of the intrusion of two phases of granite bosses (*Erinpura* and *Idar* granite). The

constituent rocks of the Delhi system comprise 5,100 metres of slates, schists and hornstones, with massive development of limestones and quartzites. Over the whole of its extent, the Delhi system exhibits violent unconformity to the Arāvallis, while towards its overlying the *Vindhyan system* to the east, it shows a steeply faulted contact.

The main economic interest of the Cuddapah system is in its store of building stones, some workable deposits of barytes and asbestos, steatite, and bright-coloured jaspers.

The next succeeding system of strata, consisting of 4,200 metres of almost undisturbed or horizontally-bedded sediments, rests over the denuded surface of the Cuddapah rocks. It covers large tracts in Madhya Pradesh, where two well marked divisions of the system are observed—the Lower Vindhians, composed of slates and shales with limestones and the Upper, composed exclusively of sandstones and some shales. Contemporaneous volcanic action is evident in the Lower Vindhians of Rājasthān, which has a large development of lavas and volcanic matter (*Malani rhyolite*). The Lower Vindhians in the Son valley are known as the *Semri series* and in the Bhīma valley they are known as the *Bhīma series*. South of the Narmada, in the Cuddapah basin, the same rocks are known as the *Kurnool series*, resting unconformably on the Cuddapah system.

The Upper Vindhians, in their type area north of the Narmada, occupy a large part of the country and constitute three well marked divisions—the *Kaimur series*, the *Rewa series*, and the *Bhander series*.

Except for a few obscure traces of animal and vegetable life occasionally found in the Vindhyan sandstones, this system is devoid of any recognizable fossil remains. From the evidence of some primitive, obscure molluscoid and algal remains, the upper limit of the Vindhyan system is believed to extend to the Lower Cambrian period.

The Vindhyan system, though devoid of any metalliferous deposits, is of considerable economic importance because of its unlimited store of building stones of great beauty and durability. It has yielded building stones for some of the finest specimens of Indian architecture, such as the famous stupas of Sānchi and Sārnāth and the Mughal palaces of Delhi and Āgra. The modern Government edifices of Delhi are built of Upper Vindhyan sandstones. The famous "Golconda" diamonds, for which India was once a much-sought market, were derived from some conglomeratic bands interstratified with the Upper Vindhians.

The Himālayan representatives of the Purāna system are recognizable by their lithological resemblance with their Peninsular congeners, occurring in wide bands of metamorphosed sedimentary complex, separating the central axial ranges from the lesser Himālayan ranges. It is believed that formations such as the *Dogra slates*, *Simla slates* and a part of the *Dalings* of the Eastern Himālayas are extensions of the Peninsular Purānas, caught up in the Himālayan system of flexures. It was during the Vindhyan period that the Arāvalli mountains received their major uplift. Since then, the Peninsula of India has experienced no orogenic movement of the crust of any significant nature.

#### *4. The Dravidian Era*

The Dravidian era covers the largest section of the Palaeozoic time, from the Cambrian to Middle Carboniferous. But unlike in the rest of the world, this era is unrepresented in the Deccan almost in its entirety. In the Himālayan zone and its extensions in the surrounding regions, on the other hand, the whole group is found developed in a more or less continuous sequence of marine strata. These, by reason of their well preserved fossil remains, can be correlated with their European parallels with sufficient accuracy to warrant their designation by standard stratigraphic names such as Cambrian, Silurian, Devonian, and Lower and Middle Carboniferous.

In the Deccan, these geological periods are completely missing; for, succeeding the Vindhyan there is a total blank in the geological sequence. In other words, a number of geological ages passed away without leaving any record of rocks and signifying that no sedimentation took place in these vast intervals of time; but the surface of the Deccan land-mass remained exposed to denudation and the wear and tear of meteoric forces. We might compare the geological record as preserved in the Deccan to a manuscript of history out of which entire sections dealing with groups of dynasties have been torn out, several others mutilated or damaged, and only a few chapters left decipherable.

The materials for the geological history of India during the Dravidian era are to be sought in the extra-Peninsular mountain zone and outlying terrains such as the Salt Range of West Punjab,

Palaeozoic  
record missing  
in the Deccan

Chitrāl and Hazāra in Pākistān, and Burma. The representatives of the Cambrian system are to be found in Kashmīr and in Spiti, where a complete and conformable sequence of marine fossiliferous strata, many thousands of metres thick, is found. The characteristic Cambrian fossils at these localities are trilobites and brachiopods, *Agnostus*, *Olenus* and *Lingulella*, which fully establish the homotaxy of the Himālayan Cambrian with the Cambrian of the rest of the world.

The Cambrian period of the  
Himālayas

Massive beds of pure crystalline salt aggregating 170 metres in thickness, associated with gypsum, underlie the Cambrian succession in the Salt Range mountains at Khewra in Pākistān. The exact structural relations of the salt with the overlying *Neobolus*-bearing Cambrian beds is not clear and some geologists believe that the salt is of Tertiary age and its present position is the result of an underthrust.

Overlying the Cambrian in both Kashmīr and Spiti areas, there come variable thicknesses (600-900 metres) of Ordovician, Silurian and Devonian rocks, characterized by their typical fossil remains, trilobites, brachiopods, corals and crinoids bearing close affinities with the Palaeozoics of Europe and North America. The Kashmir sequence is fuller and more widely distributed than the Spiti sequence, though its fossil remains are not so diversified or abundant as in Spiti.

Overlying the Devonian in both these localities are 900 metres of Lower and Middle Carboniferous strata designated under the names of the *Syringothyris limestone* and *Fenestella shales*. These contain a succession of marine faunas of molluscs, trilobites and corals, which enable a more or less precise classification of the record into series and stages. In the rest of the Himālayas there are vast tracts which are yet geologically unexplored; in these, representatives of the marine Palaeozoic systems are yet unknown. The only other area where marine fossiliferous Palaeozoics occur is Chitrāl, beyond Hazāra, in Pākistān. But here also large gaps occur and several of the Palaeozoic systems are missing. These facts suggest that the enormous land period of the south prevailed also in this part, and that the shores of the northern sea in which the Himālayan Palaeozoics were laid down barely touched North-west Punjab at long intervals. Altogether, the Dravidian era of geology for the greater part of India has left but a sketchy and interrupted record of the life and events of the time and at only a few localities.

*5. The Aryan Era—Upper Carboniferous to Pleistocene*

We may now turn to the next, the *Aryan era*, commencing from the Upper Carboniferous, for a connected story of India's past geography and geological history, which is preserved in some degree of fullness in the Peninsula and in a long and perfectly legible sequence of events in the Himālayan range along its entire northern (Tibetan) border.

With the end of the Middle Carboniferous, the second era of geological time-scale in India ended. Before proceeding to the description of the succeeding era, we have to consider Physiographical changes a great revolution in the physical geography of India at this epoch, by which profound changes were brought about in the relative distribution of land and sea. The readjustments that followed these crust-movements brought under sedimentation large areas of India which hitherto had been exposed land-masses. An immense tract of India now forming the northern zone of the Himālayas was submerged under the waters of a sea which invaded it from the west and overspread North India, Tibet and a part of China. This sea, the great *Tethys* of geologists, was the ancient central mediterranean ocean which encircled almost the whole of the earth equatorially at this period of its history, and divided the continents of the northern hemisphere from the southern hemisphere. It retained its hold over the Himālayas for the whole length of the Mesozoic era and gave rise, in the geosynclinal trough that was forming at its floor, to a system of deposits which recorded a continuous history of the ages between the Permian and the Eocene. This long cycle of sedimentation constitutes the second and last marine period of the Himālayas.

During this interval, the Peninsula of India underwent a different cycle of geological events. The Upper Carboniferous movements interrupted its long unbroken quiescence since the Vindhyan. Although the circumstance of its being a horst-like segment of the crust gave it immunity from deformation of a compressional or orogenic nature, yet it was susceptible to another kind of crust-movements characteristic of such land-masses. These manifested themselves in tensional cracks and in the subsidence of large linear tracts in various parts of the country between more or less vertical fissures of dislocation in the earth (block type of earth-movement), which eventually resulted in the formation of chains of basin-shaped depressions on the old gneissic land. These

basins received the drainage of the surrounding country and began to be filled by its fluviatile and lacustrine debris. As the sediments accumulated, the loaded basins subsided more and more. Subsidence and sedimentation going on *pari passu*, there resulted thick deposits of freshwater and subaerial sediments, thousands of metres thick, entombing among them many relics of the terrestrial plants and animals of the times. These records, therefore, have preserved the history of the land surface of the Indian continent, as the zone of marine sediments, accumulated in the geosynclinal of the Northern Himālayas, have preserved that of the oceans. Thus, a double facies is recognizable in the two deposition areas of India in the systems that followed—a marine type in the extra-Peninsula and a freshwater and subaerial type in the Peninsula.

The commencement of the Aryan era (Upper Carboniferous of the standard stratigraphical scale) as stated above ushered in an epoch of powerful earth-movements and of profound geographical changes. These changes were initiated by an Ice Age, which has left its characteristic marks at a number of centres over India, from the Outer Himālayas to Orissa, in glacial till, boulder-beds and conglomerates. The extra-Peninsula from Hazāra in Pākistān to the extreme east of Assam now enters upon a long marine period receiving a vast pile of marine sediments, encompassing the whole of the Mesozoic and a part of the Cainozoic era. These deposits today form the bulk of the Inner Himālayas.

In the Deccan, as stated before, the end of the Dravidian and the beginning of the Aryan era brought in a different kind of earth disturbances and a new chain of events. The drainage of a vast continental land-area, discharging its sediments into a chain of inland depressions and basins, has preserved in them countless remains of land-inhabiting plants and animals, which today are valuable documents of past life and geographic conditions prevailing during the middle ages of earth history.

Henceforth, the succeeding Palaeozoic and Mesozoic systems exhibit a marine facies in the extra-Peninsula and a freshwater and terrestrial type of deposits in the rest of India. This latter system of Mesozoic land deposits is known in Indian geology as the *Gondwāna system*—from the typical basins of these rocks in the Gondwāna country to the south of the Narmada valley, where they were first studied and brought to the notice of the world.

Table of correlation of the series and stages of the Gondwāna System in different parts of Peninsular India

SYSTEM. SERIES. STAGES.	DĀMODAR VALLEY	RĀJMAHAL	SATPURA	GODĀVARI VALLEY	EAST COAST	CUTCH	AGE
Upper Gondwāna	—	—	—	—	Tripetty, Pavalur, etc.	Umia. <sup>3</sup>	Lower Cretaceous.
Umia. Jabalpur. Rājmahāl.	Rājmahāl.	Jabalpur. (Athgarh sandstone).	Jabalpur. Changan. Chittaria.	Chikiala.	Raghavapuram, <sup>a</sup> Sripernatur, etc.	Jabalpur.	Upper Jurassic.
Kota. <sup>1</sup>	—	Dubrajpur sandstone.	—	Kota.	Golapilli and Budavada <sup>a</sup> stages.	Lias.	
Maleri and Parsora.	—	—	Tiki. Parsora.	Maleri.	—	Keuper and Rhætic.	
Mahādev (or Pachmarhi) Pānchet.	—	Durgāpur.	Bagra. Denwa.	Pachmarhi.	—	Muschelkalk.	
Dānuda.	Rāniganj. Ironstone shales (Barren measures), Barākar.	Pānchet.	—	Pānchet or Mangli.	—	Bunter.	
Talchir.	{ Kātharbari. Talchir.	Hingir.	Bijori.	Kāmuli.	Chintalpudi sandstone.	Upper Permian.	
		Barākar.	Barākar.	Motur. Barākar.	Barākar.	Middle Permian.	
				Umariā marine beds.	Umariā		
				Kātharbari. Talchir.	Talchir.	Upper Carboniferous.	

<sup>1</sup>The relationship of the Kota and Rājmahāl stages is uncertain; possibly the Kota beds are younger than the Rājmahāl.<sup>a</sup>These beds are now assigned to the Lower Cretaceous.<sup>3</sup>The lower Umia beds are uppermost Jurassic.

### *The Gondwāna System*

The enormous system of continental deposits known as the *Gondwāna system* forms one conformable and connected sequence of strata, aggregating over 6,000 metres in thickness, divided into a number of series and stages (Table Upper Carboniferous to Jurassic p. 132). Investigations in other parts of the world—South Africa, Madagascar, Australia and South America—have brought to light a more or less parallel group of continental formations exhibiting much the same physical as well as stratigraphic and palaeontological characters. From this firmly established evidence, it is argued by geologists that land connection existed between these distant regions across what is now the Indian and South Atlantic Oceans, forming one continuous southern continent, which united within its borders South America, South Africa, India and Australia. It is now believed from further evidence that large parts of the Antarctica also formed a unit of Gondwānaland. The northern frontier of the Gondwāna continent was approximately coextensive with the central chain of high peaks of the Himālayas and was washed by the waters of the Tethys sea.

The Gondwāna system is in many respects a unique formation which has preserved the history of land surface of a large segment of the earth for a vast measure of time. It is entirely composed of fluviatile and lacustrine land deposits, in which are preserved numerous terrestrial plants, insects, fishes, amphibians and reptiles, as in the alluvial deposits of modern river valleys. Climatic vicissitudes, from arctic cold of the Glacial Age to tropical and desert conditions, are readable in the occurrence of characteristic strata enclosed in this thick pile of sediments. Its mode of origin is also unique. The rivers deposited their detritus into faulted depressions; these, through the continually increasing load of sediments poured into them, kept on sinking relatively to the surrounding Archaean and Vindhyan country from which the sediments were derived.

This system is of wide distribution in Eastern and Central India in the valleys of the Dāmodar, Mahānadi and Godāvari rivers; in Madhya Pradesh; in the Sātpura mountains; and in small patches in the Salt Range mountains of West Punjab in Pākistān, Kashmīr and Sikkim. The accumulated drift of the dense forest vegetation covering Central India in those times has given rise to thick buried seams of coal interbedded with the lower

part of the Gondwānas, which thus constitutes one of the most productive rock-formations of India.

At the base of the Gondwāna is a group of strata known as the *Talchir series*, widespread from Hazāra to Orissa, composed of boulder-beds, containing an assortment of ice-scratched pebbles, and boulders of all sizes up to several cubic metres embedded in a fine-grained matrix such as is typical of glacial deposits of the Ice Age. These beds testify to the prevalence of glaciers and ice-sheets covering the land surface of India from as far north as lat. 33° to lat. 20°N. A parallel series of glacial boulder-beds at the same horizon occurs in the Upper Carboniferous of South Africa, Australia and parts of South America. The glacial series is overlain by a thick succession of strata with interbedded coal measures aggregating 2,400 metres in thickness, which is recognized in Indian geology as the *Damuda series*. The Damuda series carries the most important coal deposits of India, supplying 55 million tonnes of coal per year. A wealth of fossil plants, chiefly cryptogamic, occurs in the Damudas, of which *Gangamopteris* and *Glossopteris* are the most important and typical. Other plants are of the order of ginkgos, cordaites, ferns, equisetums and lycopods.

The Damuda series is succeeded by a thick group of Middle Gondwāna beds belonging to the three series, *Pānchet*, *Mahādev* and *Maleri*, which in geological age are coeval with the Triassic system of Europe. These strata bear witness to a climatic revolution in which the luxuriant forest vegetation of the previous age had disappeared and desert conditions supervened, throughout its 3,000 metres of barren sandstones and red clays, carrying few plant remains but entombing many fossil fish, amphibians and reptiles. Among these are the labyrinthodonts, *Mastodonsaurus* and *Gondwanosaurus*, from the Maleri beds of Sātpura. This group is well displayed in the Sātpura range, forming important constituents of the Mahādev and Pachmarhi hills of Madhya Pradesh and over a long stretch of country in the erstwhile Hyderābād State.

The upper division of the Gondwāna system, from the evidence of the few fossil reptiles and preponderance of ferns, conifers and cycads, is determined to extend in geological age from the Jurassic to Lower Cretaceous. Outcrops of Upper Gondwāna are seen at a number of localities from the Rājmahāl hills in Bihār to the neighbourhood of Madras. The Upper Gondwāna flora, consisting of preponderant cycads belonging to the genera *Ptilophyllum*, *Williamsonia*, etc., marks a distinct advance in modernity over the *Glossopteris* flora.

The Talachir  
Ice Age

of the Damuda age of Lower Gondwāna. These strata, grouped into the *Kota*, *Rājmahāl*, *Jabalpur* and *Umia* series, are typically seen in the gigantic escarpments of the Sātpura range and in a large outcrop in the Godāvari basin. There are also solitary outcrops along the Coromandel Coast. In the Rājmahāl hills of Bihār, a more massive development of the Upper Gondwānas is observed, resting unconformably on the Damuda series. Here the Upper Gondwānas are associated with 600 metres of volcanic eruptions, basalts and dolerites. The Rājmahāl series is distinguished by its rich, classical assemblage of cycads, ferns and conifers. The Rājmahāl cycad flora is believed to be the direct ancestor of modern angiosperms. For Kutch and Kāthiāwār, the Upper Gondwānas have a special interest, since they are intercalated with marine Upper Jurassic strata containing cephalopods and lamellibranchs. The full sequence, 900 metres thick, is seen at Umia in Kutch. Near Wadhwān in Kāthiāwār is seen another outcrop of the Umia series.

The fossil flora and fauna found in Brazil, Australia, Madagascar and South Africa from parallel groups of deposits resting upon basal glacial conglomerates, possess striking affinities with the Indian Gondwāna flora and fauna. From this fact the conclusion is drawn that this old-world Gondwāna continent persisted as a prominent feature of the southern hemisphere from the end of the Palaeozoic to the beginning of the Cretaceous. It then disappeared as a geographic entity by fragmentation into constituent units, some of which foundered under the waters of the ocean, forming parts of the Indian Ocean, the Arabian Sea and the Bay of Bengal. Another theory ascribes the dismemberment of the once compact Gondwāna continent to its breaking up through fissures and the drifting away of the constituent blocks of Australia, India, Arabia, South Africa and South America across the oceans in various directions to their present positions. (See Table of *series* and *stages* of the Gondwāna system at p. 132).

India's estimated reserves of Gondwāna coal are of the order of 50,000 million tonnes, of which about 95 per cent are contained in the coal measures of the Lower Gondwānas. In general, Gondwāna coals are bituminous, good quality steam and gas coals, with 11 to 28 per cent ash, and of 6,000 to 7,500 calorific value. Anthracite coal is rare and deposits of coking coal are confined to 3 or 4 Bihār coal-fields. But good quality metallurgical coke is being produced by washing and blending semi-coking varieties with Jharia coal.

A totally different succession of geological events was taking place in the north during the Gondwāna era, resulting in the formation of a quite different set of rock-records. Aryan era in the Himālayas Commencing from the Upper Carboniferous, these rock deposits were laid down on the broad basin of the Tethys, the mediterranean sea which extended from the southwest extremity of China to the Atlantic end of the present Mediterranean (the small remnant left after the disappearance of the Tethys). In this pile of marine sediments, more than 9,000 metres thick, representatives of the Upper Carboniferous, Permian, Trias, Jurassic, Cretaceous and Eocene periods are found, containing well preserved suites of characteristic fossils. The wealth of fossil life preserved in the Himālayan Mesozoic is described in a series of voluminous Geological Survey of India publications, the *Palaeontologia Indica* series, by a number of distinguished European scientists. The rock-systems are clearly exposed in magnificent escarpments to the north of the Central Himālayan axis in Kashmīr, Spiti, Garhwāl, Nepāl and further east in Sikkim, where the Tibetan plateau ends in gigantic cliffs. In their lithologic constitution as also in their contained fossils, these systems show kinship with the Alpine and other European Mesozoic areas rather than with the marine Mesozoic of South India. The North Himālayan profile sections are known as some of the most perfect and legible expositions of the stratified crust of the earth. There are no unconformities or lost intervals in them.

Portions of the sea-floor subsiding in the form of immense troughs concurrently with the deposition of great thicknesses of sediments are called geosynclines and the Himālayan rock-sequence furnishes one of the best illustrations of geosynclinal formations. The immense and continuous accumulation of deposits in one belt, by overloading it, disturbs the gravitative equilibrium of the crust in course of time; consequently, the overloaded and weakened belts come to be wrinkled up by tangential, compressive earth forces to form the mountain chains of the world.

In Kashmīr, the Permo-Carboniferous system attains a thickness of some 6,000 metres composed of a varied assemblage of rock types, sedimentary and volcanic, marine as well as freshwater. A well marked unit among them is the *Productus limestone*, bearing the brachiopod genera *Productus* and *Spirifer*, indubitable index fossils of the Permian age, succeeded by slates and a great thickness of volcanic eruptives, both lava and pyroclastic (*Panjāl* trap). This is in turn succeeded by a well developed sequence of Triassic strata,

Marine  
Mesozoic of  
Kashmīr

mostly composed of fossiliferous limestones, in which the preponderant fossils are numerous genera of *Ammonites*, *Otoceras*, *Ophiceras* and *Meekoceras*, well displayed in the cliffs of the Sind and Liddār valleys and in Gurais. The fully developed Triassic system is succeeded by a series of calcareous and argillaceous strata showing a less perfect, patchy and fragmentary development of the Jurassic and Cretaceous, both in respect of the area they cover and in their fossil remains.

In the Spiti area, at the back of the crystalline axis of the Kāngra Himālayas, is witnessed a fuller and more perfect sequence containing all the series and stages of the Permian, and the Triassic, Jurassic and Cretaceous, encompassing the whole range of the Mesozoic. This contains a succession of varied fossil faunas of Alpine and European affinities, mostly composed of cephalopods and lamellibranchs. From the testimony of its fossils, the Spiti sequence is divided into systems, series and stages correlated to the homotaxial divisions in the rest of the world. Notable among these for its faunal wealth is the *Spiti shales* (Jurassic) which forms a well marked horizon of Jurassic strata stretching almost uninterruptedly from the Pamīrs and Hazāra to Nepāl and Bhutān. At the top of the Mesozoic of Spiti are the *Giumal* and *Chikkin* series of the Cretaceous, which are equally well recognized in the Hazāra, Kashmīr and Garhwāl Himālayas by their characteristic lithology and fossils. These formations are well displayed in complete sequences in the Tibetan cliffs north of the Himālayas. The eastern part of the Himālayas has, however, not received the same attention from geologists as the mountains of Hazāra, Kashmīr and Simla, and the Karakoram.

The summit of Mount Everest is formed of a Permo-Carboniferous limestone, succeeded on its northern flank by a continuous conformable succession of Permian, Trias, Jurassic and Cretaceous formations, sloping away towards the Tibetan plateau.

Representatives of the Himāyan Mesozoics are seen in different degrees of completeness in the trans-Indus mountains, in the Sind-Baluchistān ranges and in the Salt Range in Pākistān on the west, and in the Arakan Yoma and the Shan plateau of Burma on the east.

As stated earlier, during this long succession of geological ages, there were no marine deposits laid down in Peninsular India.

Mesozoics of the rest of India But in an extensive fringe area of Kutch-Kāthiāwār and in Jaisalmer (Rājasthān), representatives of marine, Jurassic and Cretaceous, do occur. They are, however, deposits of an arm of the Southern Sea peopled by a fauna different from that of the Alpine-Himāyan

province, having more affinities with Jurassic-Cretaceous of Madagascar, Transvaal and Brazil. During the Jurassic and Cretaceous, these few interludes of marine periods in the Deccan are of importance and much interest. These took place during minor inroads of the Southern Sea, on the coastal fringes of the Peninsula, which was by then partly severed from its African and Australian connections. In the most important of these, the Upper Jurassic in Kutch, there was laid down 1,800 metres of limestones, sandstones and shales containing an extraordinarily diversified assemblage of ammonite genera with thousands of species. This is divided into four series—*Patcham*, *Chari*, *Katrol* and *Umia*. The marine transgression of Kutch extended north-west as far as Jaisalmer in Rājasthān and southwards to Kāthiāwār. In another of these transgressions of the sea during the Middle and Upper Cretaceous over the Tiruchchirāppalli coast in Madras, a larger area was submerged and covered with 900 metres of richly fossiliferous marine limestones, regularly bedded sands, argillaceous and calcareous beds, resting upon the much-worn ancient land surface of Archaean gneisses.

The Cretaceous of the Madras coast is divided into three series : *Utatur*, *Trichinopoly* (Tiruchchirāppalli) and *Ariyalur series*. The highly diversified life of the period is preserved in numerous fossil brachiopods, corals, gastropods, cephalopods and lamellibranchs, together with a few reptilian remains. In a third invasion of the sea, in a narrow inlet along the Narmada valley penetrating as far as Jabalpur, a small thickness of Cretaceous coraline limestones and marls were laid down, which are today seen in a number of small detached outcrops near Baroda and Gwalior and in Kāthiāwār ; these are known as the *Bāgh* beds.

Assam had a similar temporary invasion of the Southern Sea during the Lower Cretaceous, vestiges of which are seen in patches of marine fossiliferous limestones, overlying the ancient crystalline foundations of gneisses. The geological records left by these marine incursions throw much light upon the palaeogeography of India during the successive Mesozoic periods and at the end of that era. India was then still separated by a sea from the mainland of Asia, but its severance from Australia and Africa through disruption of Gondwānaland had begun and advanced to a certain stage, the complete severance being accomplished subsequent to the Trichinopoly Cretaceous.

It is interesting to note that the fauna of the *Bāgh* beds, though of the same age, differs materially from the fauna contained in the Assam and Trichinopoly Cretaceous, the two belonging to diverse marine zoological provinces. Assam and Madras then

formed with South Africa one common and continuous coastline of the Southern Sea, while the two arms of the sea were separated by an impassable barrier—the whole width of the Gondwāna continent.

The end of the Cretaceous and the beginning of the Eocene was a period of intense volcanic activity in the Deccan of a type that has no parallel in the volcanic phenomena of the modern world. Several hundred thousand square kilometres of Mahārāshtra was flooded by quiet outflows of lava from fissures in the earth's surface which was eventually converted into a volcanic plateau over 1,800 metres in height and more than 1,000,000 sq. km. in area. The denudation of ages has carved out this plateau into numerous isolated flat-topped hill-masses which are today such a characteristic feature of the picturesque landscapes of the Western Ghāts. In the dissected sides of these peculiar Ghāt-shaped hills are seen today the piles of interbedded lava-flows, 6 to 24 metres thick in horizontal attitudes, separated occasionally by thin partings of lake or river-sediments. These *intertrappean* beds are fossiliferous and are thus valuable in preserving the relics of plant and animal life that inhabited the surrounding area during quiescent intervals of volcanism. The petrified vegetation obtained from these beds bears witness to the advanced, and more evolved forms of life of the Gondwāna period. The era of modern vegetation and plant life had already set in.

Much interest also attaches to the old much-worn land surface on which the perfectly stratified thousands-metres-high lava pile rests. In Mālwa, Madhya Pradesh and many other parts is observed, at the base of the Deccan Traps, a thin variable group of lacustrine limestones, cherts and grits—*Lameta series*. From the Lametas of Jabalpur, remains of 12 genera of fossil dinosaur reptiles have been discovered, including *Titanosaurus* and *Megalosaurus*, closely allied to the fossil giant dinosaurs of Brazil and Madagascar, together with remains of crocodiles, iguanodons and lizards.

A very remarkable character of the lavas of the Deccan Traps, having a bearing on their mode of origin, is their persistent horizontality of bedding throughout the wide area covered by them from Bombay to Nāgpur and from Indore to Dhārwar. It is only in the neighbourhood of Bombay that a gentle dip is perceptible in the trap strata, of about 5° to 10° towards the sea.

In petrological composition, the Deccan basalts are monotonously uniform. The most common rock is an olivine-free augite-basalt, which persists undifferentiated in composition

from one extremity of the trap area to the other. The rock is often vesicular and scoriaceous, the amygdules being filled by chalcedony, quartz and varieties of zeolites. Porphyritic varieties often occur with phenocrysts of felspars. Over an enormous extent, there is no evidence at all of any magmatic differentiation. A few notable exceptions, however, have been observed in Kutch, and in the Girnār hills of Kāthiāwār, where rocks of more acid or ultra-basic composition have been found associated with the basalts. In these localities are found varieties of rhyolites, monzonites, andesite, limburgite and gabbro, which are believed to be post-trappean intrusions of differentiated types, proceeding from the same magma reservoirs.

The actual mode of eruption of these enormous lava floods (originally spreading over more than 1,030,000 sq. km. and at present reduced through denudation to 515,000 sq. km.) is believed to have been discharged through long linear fissures from which a highly liquid magma welled out and spread in wide horizontal sheets. That the eruptions were not of violent volcanic nature is easily borne out by the absence of any coarse agglomerates or any vestiges of cones and craters of the usual type. Similar gigantic outpourings of lava have been observed in other parts of the world, e.g., in the plateau of Idaho in the U.S.A. and the Abyssinian plateau in East Africa.

There are many proofs of the existence of original fissures from which the lava welled out in extensive, wide fissure-dykes; these have been mapped along the periphery of the trap area. Massive dykes, several kilometres in length and of great width, have been observed. Contemporaneous igneous action both in its volcanic and plutonic phases took place on a wide scale in the inner ranges of the Himālayas, particularly in the Kumaun-Johar region, where masses of acid and basic lavas have flooded large areas, alternating with bosses of gabbro, peridotite and granite.

There is no conclusive internal evidence in the Deccan Traps themselves regarding their exact age. But the external evidence furnished by the underlying and overlying marine and estuarine strata is adequate. The eruptions were certainly subsequent to the Bāgh beds (Cenomanian), which they overlie at some places. Another indication is provided by the interstratification of some basal flows of the traps with *Cardita beaumonti* beds, whose horizon is indicated as uppermost Cretaceous. At one or two places on the West Coast, the traps are seemingly unconformably overlain by outliers of Eocene Nummulitic limestones, as at Surat and Broach.

In the Godāvari delta, a distant outlier of the traps occurs on the top of marine Cretaceous sandstones of Ariyalur age. Further evidence of a rich fossil flora occurring in intertrappean beds in the Nāgpur-Chhindwāra area and containing fossil *Nipadites* and *Azolla* is also indicative of the Eocene age. The stratigraphic horizon of the Deccan Traps is now regarded as covering the period from Upper Cretaceous to Lower Eocene.

Save for an unlimited store of road metal and the less attractive kinds of building material, the lavas of the Deccan volcanic series possess no mineral resources of any value. The ornamental stones, agates, carnelian, etc., for which Cambay was once a noted market, are derived from the filled-up cavities and steam-holes of the lava-flows. The black "cotton" soils of many Deccan Districts are believed to be the subaerial decomposition products of the surface flows of the lavas of the Deccan Traps.

In Europe, the end of the Cretaceous and the beginning of the Eocene is marked by an abrupt hiatus. A sudden and striking change in the fauna and flora takes place <sup>Tertiary systems</sup> and new and more advanced types of creatures (Cainozoic era) make their appearance. The class of reptiles, the pre-eminent vertebrates in the later part of the Mesozoic, undergo a decline and the less developed types of mammals begin to take precedence with the commencement of the Eocene. Amongst the invertebrates, the cephalopods suffer widespread extinction and their place is taken by the gastropods, which enter on the period of their maximum development. In India, although these changes in the history of life are well marked, no sharp stratigraphic unconformity between the Cretaceous and the Eocene, as in the rest of the world, is observed.

The Tertiary era is highly important in the physical history of the Deccan as well as the Himālayas. The most important surface features of India were acquired during this period and the present configuration of the country outlined. With the middle of the Eocene, secular (slow and continuous) earth-movements began, and that materially altered the geography of the Indian region.

Two great events of geodynamics stand out prominently in these readjustments: one was the final break-up of the Gondwāna continent by the submergence of large segments of it under the sea; the other was the uplift of the Tethyan geosynclinal tract of sea-deposits to the north into the lofty chain of the Himālayas. These two events were coeval with the prodigious outbursts of igneous volcanic and plutonic action that took place at the end of the Cretaceous. The

Breaking up of  
the Gondwāna  
continent

transfer of over two hundred thousand cubic kilometres of magmatic matter from the inner subcrust layers to the outer crust of the earth could not but be accompanied by profound disturbances of the isostatic equilibrium of the earth's outer shell.

The pile of marine sediments that was accumulating in the Tethys since the Upper Carboniferous began to be upheaved by

Elevation of the Himālayas      periods of orogenic movement of great magnitude, alternating with quiet intervals. From the Middle Eocene to the end of the Tertiary, this upheaval continued in three intermittent phases. The first of these was post-Nummulitic, towards the end of the Eocene. The second took place about the middle of the Miocene. The third uplift, the most important phase, was in the post-Pliocene age, which elevated the axial part of the range together with the outer Siwālik foot-hills, to form the present Himālayan chain. This phase did not cease till after the middle of the Pleistocene.

After the breaking up of the Gondwānaland, the Peninsula of India began to acquire its present restricted triangular form.

A most unequal distribution of the Tertiary rocks is observed in Peninsular and in extra-Peninsular India. In the Deccan, a

Distribution of Tertiary systems      few outcrops of small lateral as well as vertical extent are exposed in the vicinity of the coasts of Kerala and Gujarāt. In Kutch, the Tertiary rocks are seen in a more connected sequence overlying a large area of the Deccan Traps. A somewhat larger area is covered on the East Coast by marine coastal deposits of the Eocene, Miocene and Pliocene ages of which the most important is known as the *Cuddalore sandstones*. The Cuddalore sandstone stage (Mio-Pliocene) is of interest. At Neyveli, it encloses thick seams of brown coal (lignite), estimated to contain 2,000 million tonnes of much needed fuel in South India.

An enormous superficial extent of the extra-Peninsular country is covered by Tertiary rocks in a belt running along the foot of the mountainous region. It starts from the southernmost limits of Sind and Baluchistān and runs along the North-West Frontier Province of Pākistān, through the trans-Indus ranges, to the North-western Himālaya border, where it retains a great width; from there the Tertiary band continues eastwards, with a diminished width of outcrop, flanking the foot of Punjab, Kumaun, Nepāl and Assam Himālayas, up to the gorge of the Brahmaputra. Thence the outcrop continues southwards with the acute syntaxis bend of the Himālayan tectonic strike. It is here that the Tertiary system attains its greatest and widest superficial extent, passing over Eastern Assam, building the core of the Assam-Burma frontier ranges and

*Correlation of Tertiary formations*

	KASHMIR AND PUNJAB	KUMAUN HIMALAYAS	SIND AND GUJARAT	PENINSULA (South)	ASSAM	BURMA
Recent . . . . .	U. Kārewas	Sutlej alluvium	Indus alluvium	Newer river deposits; deltas	Brahmaputra alluvium	Irrawaddy alluvium laterite
Pleistocene • . . . .	III & IV Glacial 3rd Himalayan Upheaval II Glacial I Glacial	U. Siwālik L. Kārewas and U. Siwālik	Rann of Cutch	Older human artifacts; older alluvium		
Pliocene . . . . .	M. Siwālik	M. Siwālik	Dwārka Manchar	Kārikāl (?) * Cuddalore and Warkalli	Dihing Dupi Tila Tipam	Irrawaddy
Miocene • . . . .	U. M. L. Siwālik 2nd Himalayan Upheaval Absent	L. Siwālik Kasauli Absent	Gaj Baripāda	Quilon Surma	U. Pegu	
Oligocene . . . . .	L. Murree	Dagshai	U. Nari	Widespread Unconformity		
Eocene . . . . .	U. Kirthar (Chharat) Laki Rānikot	Subathu	L. Nari Tapti Kirthar Laki Rānikot	Barail Jaintia and Disang	Eocene	

Note : U, stands for Upper, M. for Middle and L. for Lower.

spreading out in Upper and Lower Burma, to the extreme south of Burma. In all these areas, the Tertiary rocks enter largely into the architecture of the outer flank of mountain ranges.

All through this extent of country, the Tertiary strata exhibit a dual facies of deposits—a lower marine facies characterizes the Eocene and Oligocene from Sind to Burma, and an upper fluviatile and subaerial, the Miocene and Pliocene. This is due to the fact that the sea in which the early Tertiary strata from Eocene to Lower Miocene were laid down was gradually filling up and was being driven back by an uprise of the bottom. It steadily retreated southwards from the two extremities of the Himālayas, the eastern end towards the Bay of Bengal and the other towards Sind and the Rann of Kutch. River and estuarine deposits continued after the Middle Miocene to be laid down on the site of the obliterated sea-bed.

The last remaining chapter of the Aryan era in the Himālayas is contained in deposits referable to the Eocene system, marking the commencement of the Tertiary era (the Cainozoic).

The Eocene system

These occur in two isolated outcrops in the Inner Himālayas, one in the Ladākh District of Kashmīr, the other in the area of Kumaun. In Ladākh, north of the central crystalline axis of the mountains, there is a narrow elongated band of Nummulitic limestone with associated beds of sediments, intercalated with basic lavas. The Nummulitic limestone is a landmark of the closing marine period of the Himālayas, deposited in gulfs left behind by the retreating Tethys before its final disappearance. For, with the end of the Eocene, the first phase of upheaval of these mountains was due to commence.

Nummulitic limestone, the indubitable index-mark of Eocene age in most parts of the world, is developed on a far larger scale in the Outer Himālayan ranges and their extensions, the extra-Peninsular hill ranges of Sind-Wazīristān in Pākistān on the west and of Assam-Burma on the east.

The Eocene is divided into three series, *Rānikot*, *Laki* and *Kirthar*, in the order of superposition, it is highly fossiliferous, containing a varied fauna of foraminifers, gastropods, coral and echinoids. The upper part of the Eocene with the Oligocene carries the main petroliferous horizon of India. In Assam and Gujarāt, recent explorations in these series have revealed the possibility of obtaining an annual yield of 4 to 5 million tonnes of petroleum.

The Eocene is well developed in Baluchistān and Sind (which is taken as the type area); in the north and south margins of the

Potwar plateau in Pākistān; and in a narrow interrupted band in the Outer Himālayas from the Jhelum to Naini Tāl. In Assam, it covers hundreds of square kilometres, where its main constituents are the *Jaintia* and the lower part of the *Barail series*; the latter is of considerable economic importance, since it carries thick seams of lignitic coal and some oil-measures. The coal of Jammu and lignite of Bikaner are also deposits of this age.

The Eocene and the early Tertiaries possess considerable mineral resources. Besides the petroleum and brown coal (lignite) already referred to, they carry important rock-salt deposits at Kohāt (N.W.F.P. in Pākistān) and Mandi (Himāchal Pradesh), and gypsum beds in the Bikaner area of Rājasthān. An unlimited store of good limestone fit for cement manufacture is contained in the Nummulitic limestone beds of this period.

Whether marine conditions persisted throughout the Oligocene in most of the deposition centres is doubtful, for there is a considerable hiatus between the Eocene and the next Oligocene and Lower Miocene succeeding Lower Miocene in most parts of the Outer Himālayas. The upper part of the 4,500 metres thick Barail series of Assam is believed to be of Oligocene horizon, though convincing fossil evidence is lacking. It is, however, notable for enclosing many productive oil-sands. With the end of the Oligocene, marine conditions mostly disappeared from North India, the next succeeding formation being a thick series of fluviatile red and purple sandstones and shales (*Murree series*) occupying a wide outcrop in the Punjab Himālayas. The parallel of the Murree series in the Kumaun Outer Himālayas are the *Dagshai* and *Kasauli series*. In Assam, it is known as the *Surma series*. These rocks are poorly fossiliferous, containing some badly preserved plants and vertebrate remains. The retreat of the sea from North India by the end of this period was complete and final.

The newer Tertiary system of rocks, designated the *Siwālik system*, attains much greater lateral as well as vertical dimension, being over 6,100 metres thick and covering long stretches of the extra-Peninsula. The name is derived from the Siwālik hills near Dehra Dūn. Here rich deposits of fossil mammals were obtained, and these have enriched many museums of the world. The Siwālik system (Middle Miocene to Lower Pleistocene) They are wholly composed of freshwater and subaerial deposits laid down in river basins and estuaries. Along the Himālayas, they form a continuous range of low foot-hills, fringing the mountains over a width of 16 to 48 km. from the Indus to Sikkim, and also extending on both its flanks to Sind-Baluchistān and to Assam and Burma. Lithologically, the Siwāliks are composed of alluvial

detrital matter derived from the subaerial waste of the Himālayas, swept down by the numerous rivers and deposited at their foot. The Siwālik system has been involved in the last phase of upheaval of the Himālayas and in the severe compression to which they have been subjected. They are separated from the older rocks of the Middle Himālayas by a prominent line of faults and overthrusts.

From a palaeontological point of view, the Siwālik system is of the highest importance, noted for the wealth of fossil genera and species of extinct elephants, rhinoceroses, horses, giraffes, pigs, hippos, deer, bovids, antelopes, carnivores and anthropoid apes. These animals are the immediate ancestors of existing higher mammals and are not far distant in age from our own times. There are over 20 genera and species of fossil elephants in place of the one single living species, and an equally large number of equids, bovines and pigs and nearly 15 genera of anthropoid apes, the highest mammals in the then existing world, some of which are believed to be links in the line of human ancestry. Many factors must have helped in the development and differentiation of this fauna; among these favourable conditions, the abundance of food supplies and the presence of a suitable environment under a genial climate in a land watered by many rivers and lakes must have been most important. This large assemblage of mammals is, however, believed to be not of wholly Indian origin. According to Dr. Pilgrim, India received large migrations of herds of quadrupeds from such areas as North-east Africa, Arabia, Central Asia, and even North America, by way of land-bridges across Alaska, Siberia and Mongolia. On the testimony of the enclosed fossil remains, the Siwāliks are divided into Lower, Middle and Upper series, all composed of a monotonous succession of coarse sandstones, highly coloured red and brown shales and conglomerates. Amongst the more noteworthy fossils entombed in the Siwāliks are *Dinotherium*, *Mastodon*, *Elephas*, *Stegodon*, *Hippopotamus*, *Indratherium*, *Sivatherium*, *Pal-hyaena*, *Giraffa*, *Hipparium* and the apes, *Sivapithecus* and *Dryopithecus*.

A very full and comprehensive account of the Pleistocene is preserved in India. In comparison with it, the rest of the geological record appears sketchy and fragmentary. It is of great value as linking up prehistory with the geological history of India and of a large section of South Asia. The following phases of the Pleistocene of India deserve notice:

The Ice Age of India.

The Indo-Ganga alluvium of the plains of India.

The Rājputāna (Rājasthān) desert and the Rann of Kutch.

The laterite cap of the Peninsula : loess, the *regur* soils.

The older alluvia and high-level terraces of the Peninsular and Himālayan rivers and the old lake deposits of Kashmīr.

Cave deposits : human cave-dwellers and their animal contemporaries.

The Human Epoch.

The last stage of the Siwālik was in force when the Tertiary era came to an end with the commencing of the Pleistocene (the Quaternary era of earth history).

**The Ice Age** In all parts of the northern world, this period is distinguished by the onset of the Ice Age, which culminated in the establishment of arctic conditions up to the latitude of 49°N. The northern parts of all the continents (except Africa) were covered under vast glaciers and ice-sheets, radiating from the higher ground. The evidence of this great refrigeration of climate is well preserved both in the physical records, as for example in the characteristic glacial topography buried under morain deposits, as well as in the organic records i.e., the effect of this extreme climatic vicissitudes on the living plants and animals of the period, and in the migration or extinction of species. Except the elevated ground of the Himālayas, the rest of India did not experience the full force of the Ice Age. In the Himālayas, everywhere, there is evidence of extensive glaciation of the mountains up to the altitude of 1,800 metres, while glacial drift and terminal moraines extend down even to altitudes of 1,400 metres, covering hill-sides and valley-floors. In the rest of India, the incidence of the Ice Age was felt in a great lowering of temperature, increased rainfall and humidity, and, more strikingly, in the sudden extinction of the population of Siwālik mammals which had flourished in such profusion in the immediately preceding age. Their widespread extinction is attributed to the intense cold of the Ice Age, a change in their physical environments, which the more highly specialized mammals could not withstand. The less organized, comparatively simpler creatures could survive it by adapting themselves to the altered surroundings, or by migration to less severe environments. Interesting glaciological investigations have been made in the Kashmīr Himālayas and the Karakoram region. Some of the largest glaciers outside the Polar circles are still found in this region. The Central and Eastern Himālayas have not received the same attention. On the north flank of the Pīr Panjāl and on the ranges bordering the Kashmīr

valley to the north, four distinct Glacial stages, separated by three Inter-Glacial stages, have been worked out by Dr. de Terra.

The most important and widespread Pleistocene geological formation of the country is the *Indo-Ganga alluvium* filling the great depression between the foot of the Himālayas and the edge of the Vindhya-Kaimur range, created as a concomitant of the Himālayan uplifts of the Tertiary times. The alluvial deposits, mostly sand and silt, brought down by the hundreds of tributaries of the Indus-Ganga drainage system, form the great plains of North India occupying an area of 770,000 sq. km. of the country from Rājasthān, through Punjab, U. P. Bihār and Bengal, to Assam. The exact depth of the alluvium has not been ascertained but recent geophysical exploration shows that it is variable from less than 1,300 to over 1,800 metres. Underlying the alluvium are unconsolidated Siwālik sediments and older Tertiaries and below these are more consolidated older formations, such as the Upper Gondwānas or the Cretaceous, the presence of which is indicated by good reflections of the seismic wave and also by borings. The depth is not even—it is greater in the northern than in the southern sector. The northern rim of the basin, where it adjoins the foot-hill zone of the mountains, is one of considerable faulting and structural strain. It is also probable that the alluvium conceals 2 or 3 transverse ridges due to crumpling and dislocation of the basement floor. This structural weakness of the Ganga trough has made it tectonically weak, the seismic belt of India passing alongside it and the Himāyan border. The alluvial plains have no mineral deposits but they are the greatest agricultural asset of India. There are large reservoirs of underground fresh water stored in the more porous beds, supporting thousands of tube-wells for irrigation.

An area of 102,400 sq. km. on the west flank of the Indo-Ganga plains, stretching from the west of the Arāvallis to the Indus basin, is an arid waste land covered under wind-blown sands. The Thar, the desert tract of Rājasthān, is not one flat level expanse of sands, but is diversified by rock projections, and the heaping up of sands in well marked ridges, dunes and mounds through the action of strong prevailing winds. The origin of the Rājputāna desert is attributed to long continued aridity of the region combined with the sand drifting action of the south-west monsoon winds which sweep through the area for several months of the year, without precipitating any part of their contained moisture. The true desert area is surrounded by a belt of semi-arid country, which supports a thin scrubby vegetation,

but large areas of irrigated cultivation occur here and there. The Rājasthān desert is of comparatively recent geological age, for there is historical evidence that 5,000 years ago it was a well-watered and forested tract of the country.

The Rājasthān desert tract terminates in the south-west in the broad depression of the Rann of Kutch, another tract of the Indo-Ganga depression that owes its present condition to geological processes of Recent age. It is a saline marshy plain today, dry for part of the year and otherwise covered by a shallow sea. Its sands include deep pockets and lenses of pure salt, aggregating several million tonnes in quantity. It was once an inlet of the Arabian Sea which has now been silted up by the enormous volume of detritus discharged into it by several small seasonal streams draining the arid country to the east and north-east.

An important Pleistocene or late Tertiary formation of Peninsular India is laterite. This is a residual, vesicular or pisolithic

**Laterite** clayey rock of deep red colour, composed of a mixture of hydrated oxides of aluminium and iron, derived from the alteration of subjacent parent rocks, passage into which is clearly observed. According to the preponderance of either of the oxides, laterite is at times an usable ore of iron or aluminium. It occurs as a cap, 15 to 60 metres thick, on the summits of basaltic and other rocky hills and plateaus of the Deccan, Bihār, Bengal, Assam and Madhya Pradesh, at altitudes varying from 600 to 1,500 metres. Laterite as a cap-rock extends to adjacent tropical countries, Pākistān, Burma and Ceylon, covering stretches of long exposed surfaces of ancient rock-formations. The origin of laterite is connected with the physical, climatic and denudational processes at work in humid countries with a tropical climate, subject to alternations of monsoon weather. Under such conditions of climate, the decomposition of rock-silicates goes a step further, and instead of kaolin being the final product of decay, the rock is further broken up into oxide of aluminium. The laterite of many areas, notably of Rānchi, Madhya Pradesh, Salem, Bombay and Bhopāl, is rich in concentration of hydrated alumina (bauxite), the chief ore of aluminium. The quantity of bauxite of lateritic origin is over 200 million tonnes ; of this, about 50 million tonnes have a high alumina content.

Extensive alluvial plains exist in the valleys of the Narmada and Tāpti and to a less extent in the Godāvari, Krishna and Cauvery valleys. A system of clearly defined terraces, on four or five levels and separated by hundreds of metres, is a well marked phenomenon in some Himālayān rivers too, notably the Sutlej, Jhelum, Chenāb, the

Older alluvia

Yamuna and Ganga. The latter contain material for the study of glaciation periods and early human culture. The alluvial plains of the Narmada and Tāpti are remarkable as they lie in deep rock-basins, probably faulted, rising 156 metres above the present beds of these rivers ; they too contain numerous relics of contemporary animals and human artifacts.

The valley of Kashmīr is a broad synclinal basin largely filled with an old lake alluvium, which dates back to early Pleistocene and late Pliocene. Weathered remnants of this alluvium form flat mounds or platforms (*Karewas*), sloping away from the mountains bordering the Kashmīr valley on all sides. They bear numerous relics of *elephas*, *cervus*, *rhinoceros*, human artifacts and fossil plants belonging to hundreds of species of species of semi-tropical vegetation.

Only a few caves of palaeontological interest exist in India ; of these, one occurrence has received systematic exploration—a group of small caves in the Kurnool District of Cave deposits Andhra Pradesh. From a 9-m. thick stalagmitic deposit on its floor, a large assemblage of fossil bones have been excavated, belonging to a mixture of recent and extinct species of monkeys, hyaena, bear, several rodents, an extinct rhinoceros and tiger. A few bone implements of Middle and Upper Palaeolithic culture are also associated.

In the drier parts of North-west India there are thick sub-aerially deposited wind-blown accumulations of loess—loose Loess unstratified earth and sand. They form wide mounds or platforms capping the country-side over elevations. The loess mounds form the characteristic “bad land” topography of some parts of Punjab.

Dunes of great linear extent, and height up to 60 metres, are common in the desert of Rājasthān and in the Sand-dunes semi-arid belt surrounding it. Small dunes are also met with on the dry coastal areas of Malabār and Coromandel Coasts of the Deccan.

Among the residual soils of India, one variety is of great geological and agronomic interest. This is the black soil or *regur* Black cotton soil of many parts of Gujarāt, Madhya Pradesh, Berār area and other “Cotton Districts” of the Deccan.

*Regur* is a highly argillaceous, fine-grained soil, extremely plastic and retentive of moisture. The black colour as well as the exact origin of the soil itself are obscure. Black cotton soil is of variable fertility. At places it is known to have supported agriculture for centuries without manuring or being left fallow, and with no apparent sign of exhaustion or impoverishment.

The Pleistocene of India, especially in its Middle and Upper divisions, as in other parts of the world, is marked by the presence of Man. Early Man's existence in India is revealed by his stone tools and implements preserved among the gravels of some Himālayan rivers and of the Narmada, Godāvari and Son. Varied collections of Palaeolithic implements of late Chellean and Acheulian horizons are preserved in many museums. Lately, good collections have been made from Kashmīr, Potwar in Pākistān, the Sābarmati valley, Nellore, and other areas. The earliest Palaeoliths, probably pre-Chellean, have been found in the

The Human epoch  
Stone implements of early man

*Table of approximate correlations of Pleistocene deposits of India with fossil remains*

Age	Deposits	Fossil man	Contemporary fossil animals
Sub-Recent	Modern alluvia; delta deposits; spring deposits; blown sand.	Modern man ; Neolithic man.	Living species of mammals and domestic animals.
Upper Pleistocene.	Loess ; Uppermost <i>Karewas</i> ; <i>Khadar</i> alluvium; 4th Glacial; low-level laterite.	Upper Soan & South Indian river industries ; Middle & Upper Palaeolithic fossil <i>Homo sapiens</i> .	Kurnool cave fauna; a few extinct species; many living species.
Middle Pleistocene.	River-terraces & older alluvium; Upper <i>Karewas</i> ; 3rd Glacial; <i>Bangar</i> of Yamuna & Ganga.	Middle Soan & Narmada industry; Neanderthal man.	<i>Elephas antiquus</i> ; <i>Manis gigantea</i> , <i>Rhinoceros</i> , <i>Hippopotamus</i> , <i>Equus namadicus</i> .
Lower Pleistocene.	Boulder-conglomerate stage of Upper Siwalik; Oldest river terraces; 2nd Glacial; Lower <i>Karewas</i> .	Oldest flake industry of Narmada, Godāvari & Soan; Chellean & Acheulian palaeoliths; Heidelberg man.	<i>Elephas namadicus</i> ; extinct species of <i>Hippopotamus</i> , <i>Equus</i> and <i>Bubalus</i> .
Upper Pliocene	Pinjor stage of Upper Siwalik.		<i>Sivatherium</i> , <i>Stegodon</i> , many extinct elephant species; <i>Equus</i> ; <i>Bos</i> ; <i>Equus sivalensis</i> ; mostly extinct.

Narmada and Godāvari valleys. Somewhat later proto-historic relics of Man's industry occur in the *Karewa* deposits and in Potwar, correlated to the Boulder-conglomerate stage of the Uppermost Siwāliks. No organic vestiges of Pleistocene Man in the form of his skeletal fossil remains have so far been obtained in India.

In the foregoing account of the later geological deposits of India there is everywhere a gradual passage from Pleistocene to sub-Recent and thence to the prehistoric Recent. These periods overlap each other, as do the periods of human history, and there is no general agreement among geologists as to the exact limits of each.

Here we reach the limits of geological history; further study lies in the domain of archaeology, anthropology and prehistory. When India emerged at the end of the Cainozoic era into the age of Man, it was a land-area eminently fitted in its physical setting and biological environments for the spread and development of the new and most highly developed mammal, Man.

#### *6. Late Geodynamic Forces affecting the Indian Land-Mass*

In the preceding section, the salient features of the main periods of India's geological history up to the Pleistocene, the last chapter of earth history, have been summarized. This age saw the completion of the broad outlines and relief of the earth, and the configuration of its seas and continents, mountains, plateaus and plains. In the present section we shall examine the operation of some geological agencies that have affected in a material degree the physiography of the country, but which have not been dealt with in the preceding pages. The geography of the land is still being constantly modified by these geodynamic forces. Their effect may be assessed under the following heads: definition of the coastline of India, and the submerged mountain chains and valleys of the Arabian Sea; the seismic zone of India in relation to the earthquake belt of the world and earthquakes; volcanoes; local alterations of level of land and sea; sub-Recent changes in the hydrography and drainage-pattern of North India; India's position in the desert belt of Central Asia; and the meteorological influence of the Himālayan chain in arresting continental desiccation.

The seas that surround the coastline of India are not of any great geological antiquity. They originated in the earth-movements of early Cretaceous or Tertiary times, as bays or arms of the Indian Ocean. The Coromandel Coast is certainly as old as the earliest Cretaceous. The Malabār Coast is fronted by a broad submerged continental shelf which stretches in a straight line from Karachi in Pākistān to Cape Comorin at depths of less than 180 metres. It suddenly plunges to 2,000 metres, to a deep submarine valley separating the shelf from a broad irregular submarine ridge that stretches intermittently from the latitude of Bombay to the Laccadive and Maldive Islands; this line of elevations is believed to be the continuation of the axis of the Arāvallis southwards. The smooth Malabār coastline from Cambāy to Comorin is the result of faulting; the escarpments of the Western Ghāts, parallel with the coast, are ascribed to this scarp-fault of late Pliocene time. The whole of the northern border of the Arabian Sea, from Karāchi through Arabia to the Somaliland coast, is likewise believed to be the result of tensional faults of the same period. Strata of late Pliocene age are exposed in the fault-scars of the Malabār Coast and the Persian Gulf. The Coromandel Coast from the Mahānadi has a simpler structure, having emerged from the sea at a comparatively late date, fronted with low submarine plains. This coast of India has been invaded by the sea repeatedly during sub-Recent times. The island of Ceylon is a part of the Madras mainland, severed only in recent geological, even prehistoric times. Outside the Indo-Ceylon platform, the common coastal shelf plunges down to 3,000 metres. The islands of the Bay of Bengal are all volcanic, and not coral-fringed continental islands, as is the case with the Arabian Sea islands.

The late Tertiary and Pleistocene earth-movements of the extra-Peninsula have greatly affected the seismic stability of this part of India, which forms a close unit of the great seismic belt traversing the earth from the mid-Atlantic coast, through Southern Europe, the Alps, Irān and the Indian extra-Peninsular ranges, to the extreme end of Malayan arc, where it meets the circum-Pacific earthquake zone. This girdle corresponds broadly with the prominent zone of mountain-building tectonic earth-movements of the Tertiary age, but has no close correspondence with the line of living volcanoes of the world.

The majority of Indian earthquakes have originated either from the mountain barrier on its west, north and north-east, or from the plains of India lying immediately at its foot. All the

74 disastrous Indian earthquakes recorded in the last 200 years had their epicentres in this zone. Some of the more destructive earthquakes of recent times are the Kutch quake of 1819 and the Assam earthquake of 1897, which affected no less than 4,100,000 sq. km. and was one of the most disastrous earthquakes of the world on record. The Kāngra earthquake of 1905 was felt over the whole of India north of the Tāpti. The epifocal tract was between Kāngra and Kulu. The Bihār earthquake of January 1934 shook North Bihār and Nepāl area and laid in part ruin many cities from Kātmāndu through Patna to Darjeeling. The main epicentres were Motihāri, Kātmāndu and Monghyr, lying in the fractured zone of the crust underneath the Ganga alluvial basin. The Quetta (Pākistān) earthquake of 1935 turned that city in a few minutes into a graveyard entombing 20,000 people. The area, however, enclosing isoseist of high intensity was comparatively small. That was the case also with the Makrān Coast (Pākistān) earthquake of 1945, where the tidal wave caused by the quake reached a height of 12 metres. The North-east Assam earthquake of 1950 was again one of high intensity, comparable with the 1897 disaster. The Isoseist VIII encompassed an area of 192,000 sq. km. in an unpopulated mountain terrain ; the damage was confined to landslips of great size and consequent damming of river valleys, materially altering the drainage of the country. We thus see that the catalogue of seismic disasters is confined to the extra-Peninsula and few or no earthquakes have shaken the Deccan part of India in historic times; there is no authentic record of a seismic convulsion in the Deccan area in recorded history.

There are no living or active volcanoes in the Indian region. The Malay branch of the most active living volcanoes, if prolonged to the north-west, would connect a few dormant or extinct volcanoes in this region. Of these, the most important is the volcano of Barren Island in the Bay of Bengal. This volcano has been dormant in the last 165 years. Narcondam and Popa are other extinct volcanoes of this region. The extinct volcano of Koh-i-Sultān in the Nushki desert of Western Baluchistān is another example.

The so-called Mud-volcanoes of the Arakan (Burma) and Makrān (Pākistān) coasts are due to eruptions of natural gas in petrolierous terrain and have no connection with vulcanicity.

Few hypogene disturbances have interfered with the stability of the Peninsula, but there have been some minor secular upheavals and depressions along the coasts and in the interior of the Deccan plateau, within sub-Recent times. The most important of these is an appreciable elevation of some parts of the Deccan mainland

and exposing of portions of the plain of marine denudation in front of the present coastline. Raised beaches are found at elevations from 30-45 metres at many places along the coasts of India. The scarp face of the Sahyādri mountains and their parallelism to the coast are ascribed to their recent elevation after the faulting movement already referred to. The existence of beds of lignite and peat in the Ganga delta, and near Pondicherry, and the submerged forest of Bombay coast are proofs of slow movement of depression. The submerged forest of Bombay is 3·6 metres below low water and 9·2 metres below high water level. On the Tirunelveli coast, a similar submerged forest has been observed. The recent subsidence in 1819, during an earthquake on the western border of the Rann of Kutch, is the most striking event of its kind recorded in India. Here an area of nearly 5,100 sq. km. was suddenly depressed to a depth of 3·6 to 4·6 metres below the sea, while an adjacent area of 5,180 sq. km. was simultaneously elevated several metres above the plains, into a mound which has been appropriately named by the people *Allah Bund*. The branching *fjords* of the Andaman and Nicobar Islands point to a submergence of these islands within late geological times, by which their inland valleys were drowned.

An important question in the investigation of the past hydrography of Northern India is the date of disappearance of the last remnant of the sea from the plains tract. Whether, if ever, the Deccan was an island, subsequent to the Eocene, with a coastline represented by the rocky islands and promontories of Kutch, Rājasthān, Delhi, Bundelkhand, Rewa and Rājmahāl is impossible to decide, because the desert sands and river alluvia have completely buried thousands of square kilometres of rocks along this border since that age. The Cretaceous sea of Western India (Bāgh epoch), south-west of Rājasthān, was only a narrow inlet and probably did not extend beyond Jabalpur, while the Eocene sea, though spread over a wide expanse of Rājasthān, did not go further east than longitude 74°E.

Many profound changes in the hydrography and the chief drainage lines of North India since late Tertiary and Pleistocene times have taken place. Changes, which have produced a complete reversal of the flow direction of the chief rivers of North India, have been postulated by some eminent geologists. They ascribe the Siwālik deposits to the work of a great north-west flowing river, lying south of and parallel to the Himālayan chain, from Assam to North-west Punjab, and thence flowing south-west to Sind, it carried

Local altera-  
tions of level

Changes in  
hydrography  
and drainage  
pattern

the combined discharge of the Brahmaputra, Ganga and Indus at one time—the *Indo-Brahm* river of Pascoe. This old river is believed to be the successor of the narrow strip of the sea left after the main uplift of these mountains. The final extinction of this gulf, which once stretched from Assam to Sind, left behind it a wide river basin. Post-Siwalik minor uplift movements of the ground in the Punjab brought about a dismemberment of this river system and its severance into three subsidiary systems—(1) the present Indus flowing southwards from Hazāra ; (2) the five Punjab tributaries of the Indus ; and (3) the river systems tributary to the Ganga, which after its severance from the Indus was deflected from its former course and finally took a south-easterly course.

Less important changes in still later times have taken place. The river Yamuna, the sacred Sarasvatī river of Hindu traditions in Vedic times, flowed to the sea through a separate channel now deserted (the modern Ghaggar and the Nara). In course of time, the Sarasvatī took a more and more easterly course and ultimately merged into the Ganga at Prayāg. It then received the name of Yamuna. Great changes have likewise taken place in Bengal and in the Ganga delta in the last 200 years, and hundreds of square kilometres of the delta have become habitable since then. The Tista, originally flowing into the Ganga, now discharges into the Brahmaputra ; only 150 years ago, the Brahmaputra which now flows to the west of Dacca and Madhupur jungle in Pākistān, then flowed to the east of these localities.

The drainage pattern of Peninsular India is of very high antiquity and has persisted more or less unchanged since early Gondwāna era. On the other hand, the northerly drainage of the Deccan, flowing to the shores of the Himālayan Sea (the *Tethys*) in Gondwāna times, was completely disorganized in the beginning of the Tertiary ; and subsequently, during the late Tertiary and post-Tertiary, all its main lines were buried under the 320-km. wide belt of alluvial plains of the north from Sind to Manipur. The present valley-system of Northern India, one of the youngest hydrographic systems of the world, has inherited nothing from the old ; it is an entirely superimposed drainage with no relations whatever to the old river-courses.

The Himālayan system of drainage is not a *consequent* drainage, but is of the *antecedent* type, the main channels of flow being of greater antiquity than the mountains they traverse. Hence, the main rivers flow right across the axis of the range through deep transverse gorges which they have themselves eroded. The erosion of the river-bed has kept pace with the slow uplift of the mountains.

A very well marked phenomenon of late Pleistocene, post-Glacial times is the conversion of a large part of Central Asia into a desert belt continuous with the Sahara. The Thar Desert belt of Asia desert of Rājasthān to the south of the Himālayan chain and the vast Taklamakān desert to the north are a part of this great Asian desert. This belt is largely the creation of geological agencies of sub-Recent times extending down to prehistoric and even historic. All along this vast extent there are marks of flourishing human settlements, with irrigation works, forests and other evidences of much more moist climate. The continental desiccation has arisen through increasing aridity caused by the deflection of moisture-bearing winds from the Indian Ocean and disruption of the drainage lines of the country.

The Thar area of Rājasthān has not felt the full impact of this desiccation because of the meteorological influence of the Meteorological influence of the Himālayas on the atmospheric circulation of India and the adjoining countries of Asia. On account of its altitude and its situation directly in the path of the monsoons, this mountain system is favourably placed for the precipitation of much of their moisture, either as rain or snow. Glaciers of enormous magnitude are nourished in its highest ranges. These, together with the abundant rainfall of the lower ranges, feed a number of rivers coursing down to the southern plains in hundreds of fertilizing streams. In this manner the Himālayas have protected the heart of India from the gradual desiccation which has overspread the Central Asian continent. To the same cause is ascribed the desiccation of parts of Tibet and the Tarim basin to its north-west, some of the most desolate regions of the earth today. Their desiccation is connected in a large measure with the interposition of the Himālayan chain, which has shut out the monsoonic wind circulation from the ocean. This has had its full toll on the river systems which have withered away in the growing volume of sands.

#### *7. Economic Mineral Resources of India*

In the preceding pages we have dealt with the broad features of the stratigraphical and structural geology of India, with only brief references to the economic mineral deposits contained in the successive rock-systems. It is necessary to review here the general picture of mineral products associated with the various rock-systems of India and the economic resources they possess.

An appraisal of the total mineral resources of India so far known to geologists brings home the fact that the mineral wealth of India is not inconsiderable for a country of her size and population. The resources include a sufficient range of useful products that are necessary to make a modern civilized country more or less industrially self-contained. Except in the case of minerals such as iron-ore, aluminium-ore, titanium-ore, manganese and rare metals, mica and a few other minerals, the resources in economic minerals and the non-ferrous metals are, however, limited. New mineral deposits of any extent and richness are not likely to be discovered by ordinary geological methods. But the new geophysical methods of locating underground minerals by electrical, magnetic, gravimetric and seismic methods seem to offer possibilities of bringing to light hitherto undiscovered deposits of petroleum, coal, natural gas, underground water and metallic lodes.

Barring coal and petroleum, and the somewhat disputed position of salt and gypsum due to their undecided age, the bulk of the valuable minerals and metals obtained in India are products of rocks of pre-Palaeozoic age, confined to metamorphic rock-systems of either the Archaean or pre-Cambrian period. The principal ore and metal deposits, the precious and semi-precious stones, mica and a large number of industrially valuable minerals are derived from the Dhārwār system. Ninety-eight per cent of the coal is of Lower Gondwāna age, the remainder being Tertiary. The main petroleum horizons in India are Tertiary.

Nature has made a very unequal territorial distribution of minerals in the Indian region. The vast tract of alluvial plains of Northern India is devoid of economic minerals. The terrain of Bihār and Orissa possesses the largest concentration of ore-deposits, such as iron, manganese, copper, aluminium, chromium and the atomic metals thorium and uranium; valuable industrial minerals like mica, sillimanite and phosphates; and over three-fourths of India's reserves of coal, including coking coal. The iron-ore reserves lying in one or two Districts of Bihār and in the adjoining territories of Orissa are calculated at over 8,000 million tonnes, surpassing in richness and extent those of any other known region. There are large reserves of manganese-ores. Over 50 per cent of the world's best mica, block, splittings and sheet, is supplied by the mica mines of Kodarma and Gaya in Bihār. The second mineral-rich province is Madhya Pradesh, carrying good reserves of iron and manganese, coal, limestone and bauxite. Madras and Andhra Pradesh have workable deposits of iron, manganese, magnesite, mica, limestone and lignite. Mysore

*Economic minerals of India*

Mineral	Quantity	Value (Rs.)
Asbestos . . . . .	1,700 tonnes	2,01,000
Barytes . . . . .	13,600 ,,	3,44,000
Bauxite (aluminium-ore) . . . . .	383,000 ,,	41,50,000
Beryl . . . . .	1,100 ,,	7,42,000
Building stone . . . . .	..	14,00,00,000
Chromite . . . . .	100,000 ,,	57,33,000
Clays (industrial) . . . . .	5,10,000 ,,	70,00,000
Coal . . . . .	62,600,000 ,,	148,93,46,000
Copper-ore . . . . .	442,000 ,,	2,27,25,000
Corundum . . . . .	400 ,,	1,65,000
Diamonds . . . . .	2,200 carats	5,60,000
Glass sand . . . . .	16,000 tonnes	8,62,000
Gold . . . . .	239,168 oz.	5,22,00,000
Graphite . . . . .	1,500 tonnes	1,50,000
Gypsum . . . . .	950,000 ,,	58,60,000
Ilmenite . . . . .	314,000 ,,	1,80,50,000
Iron-ore . . . . .	10,600,000 ,,	7,70,35,000
Pig-iron . . . . .	4,000,000 ,,	16,00,00,000
Steel . . . . .	2,500,000 ,,	1,00,00,00,000
Kyanite . . . . .	42,000 ,,	87,50,000
Lead-concentrate . . . . .	8,500 ,,	39,10,000
Limestone . . . . .	11,000,000 ,,	4,84,00,000
Magnesite . . . . .	162,000 ,,	28,25,000
Manganese-ore . . . . .	1,102,000 ,,	8,18,00,000
Mica . . . . .	7,200 ,,	10,50,00,000
Ochre . . . . .	75,000 ,,	5,50,000
Petroleum . . . . .	3,700,000 ,,	23,00,00,000
Salt . . . . .	4,550,000 ,,	9,80,00,000
Saltpetre . . . . .	3,000 ,,	16,50,000
Steatite . . . . .	90,800 ,,	31,23,000
Zinc-concentrate . . . . .	9,000 ,,	25,00,000

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## CHAPTER IV

### FLORA

#### 1. *Introduction*

INDIA COMPRISES THREE WELL defined geological regions: the Himālayas, the Indo-Ganga plain and the Southern Peninsula. Peninsular India is geologically old and some 110 million years ago it probably formed part of a gigantic southern continent called Gondwānaland. This was separated from a similar northern continent, called Laurasia, by the Tethys sea. Subsequently, Gondwānaland broke up and parts of it now form South America, Africa, India and Australia. The change seems to have occurred after the flowering plants had come into existence so that the flora of India has some genera in common with Africa and South America. After the disintegration of Gondwānaland, the small fragment that was to form Peninsular India drifted north-east over a distance of 1,500 kilometres. The Himālayas arose later from the bed of the Tethys sea. Their uplift resulted in a deep trough between them and Peninsular India in which the alluvium of several rivers has been accumulating to give rise to the third major geological region of India, the Indo-Ganga plain, comprising nearly 700,000 square kilometres of very fertile land. The great desert of Thar in Rājasthān represents a culmination of the vast arid belt extending from the Sahara eastward through Arabia and Baluchistān.

Few other countries of comparable size possess such a rich and varied vegetation as India. A situation between 8°4'N. and 37°6'N. of the Equator gives this country a great latitudinal spread which means a wide range of temperature conditions. Altitudinally, the extremes are even greater, ranging from sea level to the loftiest mountains of the world. Thus, between the plains and the mountains of India we have practically all the climatic zones from the torrid to the arctic. While in the plains the temperatures are never unfavourable for continuous plant activity, the highest peaks of the Himālayas are well above the limits of vegetation and are perpetually covered with snow. The humidity and rainfall range from the lowest level in the desert of Rājasthān to the maximum in the hills of Assam where Cherrapunji with an annual rainfall of nearly 1,080 cm. is reputedly the雨iest spot in the world.

The rainfall in India is governed mainly by the south-west monsoon from May-June to September-October, during which we receive much of the annual rainfall, and the north-east monsoon whose influence is felt for only a short period during the rest of the year. The climate in general is also strongly influenced by the physiography of the country, particularly the following ranges of mountains and hills: (1) the Great Himālayan range with its high and low mountains, forming an almost unbroken and effective barrier on the north; (2) the Western Ghāts running parallel and very close to the west coast of Peninsular India together with the Nilgiris and adjoining hills of Southern India; and (3) the great complex of mountain ranges flanking the Himālayas in the north-eastern corner of the country and descending into the northern parts of Burma. Of lesser and more local influence are: (1) the Arāvalli hills extending diagonally across North-western India ; (2) the Vindhyan and Sātpura escarpment lying across Central India ; and (3) the Eastern Ghāts and outlying hills of Peninsular India. Stretching between the mountains under their direct or indirect influence are the Indo-Ganga plain, the semi-arid and arid plains of Western Rājasthān and adjoining areas with the Thar desert as its nucleus, the narrow coastal plains of Peninsular India, and the Deccan plateau.

## *2. Botany and Plants of Ancient India*

India has been inhabited by man since almost prehistoric times. One of the earliest known civilizations flourished on Indian soil at a time when large parts of the world were still inhabited by savage men. Remains of the Indus Valley Civilization prove that rice, wheat, barley and cotton were already in cultivation in that remote period.

Many plants yielding food, fibre and wood were known to the ancient Hindus. Several others were recognized because of their real or imaginary curative properties in the treatment of the diseases of man. It is well known that even today, amongst primitive peoples, it is the tribal doctor who is better acquainted with the wild plants of the neighbourhood than other people. Early plant lore was, therefore, primarily utilitarian. Plants were classified into those which were wholesome to eat and others which were unwholesome or even injurious because of the poisons they contained. Decoctions of certain plants were used to alleviate pain, heal wounds or sores, create pleasurable excitement or act as

narcotics. Early Hindu treatises like the *Āyurveda*, *Caraka Saṁhitā* and *Suśruta Saṁhitā* deal with plants mainly in relation to medicine, agriculture and horticulture. The story goes that more than 2,500 years ago, Bhikṣu Ātreya, a well known professor at the University of Taxila, asked one of his pupils, named Jīvaka, who later became the physician of King Bimbisāra of Magadha, to collect, identify and describe the properties of all the plants growing within a distance of four *yojanas* from the University. Dhanvantari and Nāgārjuna were other well known persons with an intimate knowledge of the characteristics of medicinal plants. *Rauvolfia*, which has now been rocketed to world-wide popularity, finds mention in ancient Hindu manuscripts as well as in the monumental work of Caraka; the plant is described under its Sanskrit name of *sarpagandhā* as a useful antidote for snake bites and insect stings. Because of its curative effects in cases of insanity, it has long been known in Hindī as *pāgal-ki-dawā*. The great importance of this drug has been realized only recently in western medical therapy.

The sciences of Arboriculture, Horticulture and Silviculture were highly developed in ancient India. Methods of plant propagation by seed, cutting, layering, grafting and budding were prevalent and find mention in the *Vedas*, *Arthaśāstra* and *Bṛhat Saṁhitā*. Jacolliot rightly remarked: "We should not forget that India, that immense and luminous centre in olden times, was in constant communication with all the peoples of Asia and that all the philosophers and sages of antiquity went there to study the science of life."

To a small extent, there also existed the scientific study of plants irrespective of their economic value. Branches of Botany analogous to present-day Taxonomy, Morphology, Anatomy, Physiology, Ecology, Evolution and Heredity were not wholly unknown. It appears that the ancient Hindus, like the Babylonians, had some inkling of the presence of sex in plants. For example the male plants of *Pandanus odoratissimus* L.f. were called *Ketakīviphala* or *Dhulipuṣpikā*, the female as *Svarṇaketakī*, and the male and female together as *Ketakīdvayam* (or a pair of *Ketakīs*). Something about the method of production of seeds in plants is also discussed in the *Hārita Saṁhitā*. Plants were classified on the basis of their external morphology, medicinal properties and environmental associations.

In ancient India the human population was much less than what it is today. Famines were few and life was quite happy with adequate quantities of wheat, barley, rice and sugar-cane; legumes like pea, gram, *mūng* and *masūr*; and fruits such as

mango, jack, pomegranate, date, banana, water-melon and various limes and oranges. Among condiments, ginger, black pepper, cardamom, tamarind, onion and garlic were certainly there; and sesame was the most important source of oil, supplemented later by mustard and coconut. Of course, all the articles of food we now know were not there in early times. For example, papaya, custard-apple, pineapple, guava, sapota, cashew-nut, ground-nut, maize, tomato, coffee, potato, tapioca and sweet potato were unknown at that time, having been introduced from other parts of the world in comparatively recent times. Chilli, a common flavouring material of so many of our dishes, and tobacco were also unknown.

Of the greatest importance, as an article of export, was black pepper, a native of the western coast of India. It was well known to the Greeks and was later taken to Europe by Arab traders either through the Persian Gulf, Mesopotamia and Syria, or through the Red Sea and the Gulf of Suez. At one time pepper was weighed against silver and gold, and it was the high price of pepper which acted as the chief incentive for Europeans to find a sea-route to India.

Among beverages, our ancestors had neither tea, nor coffee nor cocoa, but there were the health-giving juices of many fruits such as mango, pomegranate, coconut, citron, *jāmūn* and grape. Fermented drinks were also known and there was *somarasa*, the drink of the gods. It was realized early that these drinks had an exhilarating and activating effect; they were believed to increase the power of concentration and cure numerous maladies. In spite of its special virtue of giving immortality, the origin of *somarasa* remains unknown. As to the other drinks, *sidhu* was prepared from the flowers of the *mahua* tree, *kharjūra* from juice of date palm, and *surā* from cereals.

As for clothing, Indians were perhaps far ahead of other countries. They were the first to weave cloth from cotton. Although cotton is now common in Egypt, this was not so 2,000 years ago. All the mummies have been found wrapped in linen, woven from the fibres of flax. In the 5th century B.C. Herodotus gave testimony that "India has wild trees that bear fleeces as their fruit and of these the Indians make their clothes". A curious myth prevailed among the Greeks of those times that certain trees in India bore fruits which burst to produce little lambs whose soft white fleece was used to weave the finest cloth. In medieval times the muslin of Dacca was famous.. It is said that this cloth could be woven so fine that a whole sheet could be folded and passed through a ring. The story goes that

when the Mughal Emperor Aurangzeb once admonished his daughter for being so thinly dressed, the princess remonstrated that she was actually clad in seven folds of the finest muslin. The British finally put an end to this indigenous industry since it competed with factory-made cotton goods of British manufacture.

Among the coarser fibres were the sun-hemp, *muñja*, and many others; and for stuffing, use was no doubt made of the soft silky fibre of *sālmali* or *semal* (*Salmalia malabarica* Schott et Endl.) and the seed-hairs of *ak* (*Calotropis*). There is evidence however, that the Aryans knew the *Cannabis* fibre and *bhāng* prepared from its leaves was often used as an intoxicant.

Dyes of plant origin were widely used to render colour to life. The most important dye, which was also exported to other countries, was indigo—it gave a rich blue colour of great beauty and permanence. Madder obtained from the roots of a plant known as *manjisthā* (*Rubia cordifolia* L.), which is quite common in the Himālayas and in South India, was used to give a bright red colour (especially popular in the *hemanta* season) and is still utilized by traders for dyeing the cloth used to bind their account books. Besides these, there were numerous flowers, wood and barks which gave a rich variety of colours, utilized by both men and women to make their dress more attractive.

Plants also featured in personal adornment and beautification of the home. *Tāmbūla* or *pān* with all its ingredients (*katthā*, *supārī*, cardamon, etc.) was in common use to sweeten the breath. Girls wore flowers of *Campaka* and jasmine in their hair and those of *sīriṣ* in their ears. They made garlands of many kinds of flowers and painted their foreheads and cheeks with *candana* or sandal paste obtained from *Santalum album* L. Kālidāsa makes frequent reference to these in his writings. The devotees used rosaries and bracelets of the seeds of *rudrākṣa* (*Elaeocarpus ganitrus* Roxb.) or the wood of *tulasī* (*Ocimum sanctum* L.).

The rich and the fastidious anointed their bodies before bathing with various fragrant pastes made of camphor, sandalwood, *aguru* and the roots of *khas*. *Henna* or *mehndī*, a later introduction by the Muslims, was not known in those days; but women used the lac dye to colour the soles of their feet, thus reddening the flights of their steps. They also painted their lips with it and then besmeared them with a powder prepared from *lodhra* wood, which they also used as a face powder. In the *Brhat Saṅhitā* there

are references to various types of tooth-picks, hair oils, perfumes and recipes for dyeing the hair.

According to Vātsyāyana, all big houses and palaces of kings had a pleasure garden—*vṛkṣavāṭikā* or *puśpavāṭikā*—attached to them. Season flowers like dahlia, aster, hollyhock and calendula, shrubs like bougainvillea, and trees like eucalyptus and gold mohur were not to be found then, since all these are recent introductions. However, there were other fine trees, shrubs and climbers. Among the trees, one of the most beautiful was the red-flowered *Saraca indica* L., popularly known as the *aśoka*. It is said that Sītā was confined by Rāvaṇa in a grove of *aśoka* trees. Another favourite tree of those days was the *kadamba* (*Anthocephalus cadamba* Miq.), whose flowers appear in golden balls. It was closely connected with the life of Śrī Kṛṣṇa and its abundance in the past near Mathura and Vrindāvan is perhaps an evidence of a more humid climate in this area in those days.

Among smaller plants, *tulasi* had the pride of place and is still grown in many Hindu homes. Of climbers, *mādhavilatā* (*Hiptage benghalensis* Kurz) receives frequent mention in Kālidāsa's plays, and among sweet-scented shrubs there were (as now) various kinds of jasmine, the musk-mallow (*Hibiscus abelmoschus* L.), and the garland-flower (*Hedychium coronarium* Koen.).

Among flowers, the sacred lotus (*Nelumbo nucifera* Gaertn.) was the most important and numerous references to it occur in Sanskrit literature. According to the Purāṇas, Brahmā emerged from the lotus which grew out of the navel of Viṣṇu. Lakṣmī, the goddess of wealth and prosperity, has always been shown as standing on a lotus flower. The diurnal opening of the flower was attributed to its love for the sun, which is also responsible for the name *sūrya-vikāsi*. In the days of Mohenjodaro, lotus blossoms were wreathed over the head of the sun-god.

The Hindus were so fond of trees that some of them were actually deified and worshipped. Besides *aśoka*, *padma*, and *tulasi*, the pipal and banyan were given a very high place. The tree at Buddh Gayā, under which Gautama attained enlightenment, was a pipal; its branches were taken far and wide and planted to give rise to new trees. The Hindus do not readily cut the tree since it is sacred.

There are many references to the forest trees of India in Vālmīki's *Rāmāyaṇa*. The poet lists several plants of the Citrakūṭa hills, while describing the journey of Rāma, Lakṣmana and Sītā.

### 3. *Angiosperms\**

A knowledge of the flora of India, in the modern sense, began with the zealous efforts of many European naturalists and botanists who visited India in the 17th, 18th and 19th centuries, in the wake of the struggle among European nations first for trade and then for political supremacy over the country. Heinrich van Rheede, J. G. Koenig, Robert Kyd, William Roxburgh, Nathaniel Wallich, Buchanan-Hamilton, J. F. Royle, Robert Wight and J. D. Hooker were among those who laid the foundations of Botany in India. The only comprehensive flora of India so far is *A Sketch of the Flora of British India* compiled by J. D. Hooker between 1872 and 1897. This covers not only modern India but also Burma, Ceylon, Malaya and Pākistān, and has formed the groundwork for all the later regional floras of the country of which special mention may be made of the following : *Flora of the Presidency of Madras* by Gamble, *Flora of the Upper Gangetic Plain and of the Adjacent Siwalik and Sub-Himalayan Tracts* by Duthie, *Flora of Bengal* by Prain, *Flora of the Presidency of Bombay* by Cooke, *The Botany of Bihar and Orissa* by Haines, *Flora Simlensis* by Collett, and *Flora of Assam* by Kanjilal *et al.* For a detailed bibliography on the Indian flora the reader is referred to Santapau (1958).

Hooker estimated some 174 families and 17,000 species of angiosperms and 600 species of ferns and fern allies in the flora of India. About 15,900 species of flowering plants have been described in the *Flora of British India*. As far as species are concerned, the ten dominant families are the Orchidaceae, Leguminosae, Gramineae, Rubiaceae, Euphorbiaceae, Acanthaceae, Compositae, Cyperaceae, Labiateae and Urticaceae (including Moraceae). Excepting Labiateae and Compositae, all the rest of these ten families are more tropical than temperate. The Orchidaceae alone have a representation of more than 1,600 species in the Indian region. The greater number of Indian orchids are tropical, epiphytic and endemic. The East Himalayan region abounds in orchids, but in other parts of India they are outnumbered by the Leguminosae, Gramineae and Euphorbiaceae. The Compositae, which is the largest family in the world and predominates in the flora of many countries, takes only the

\*The numbers given for families, genera and species of angiosperms in the following pages are to be considered purely approximate and tentative because of the revisions that these families, genera and species have undergone since the numbers were originally published by authors like Hooker, Chatterjee, and others. This is also true of the endemic ratios. Further, these earlier authors included in their floristic treatments, regions like Burma, Ceylon and Pākistān which are adjacent to, but now politically, not parts of India.

seventh place in India. In fact, but for its numerous representatives in the temperate and alpine zones in the Himālayas, this family would occupy a still lower place in the list.

The ten genera each with a hundred or more species are : *Bulbophyllum*, *Carex*, *Dendrobium*, *Eria*, *Eugenia*, *Ficus*, *Habenaria*, *Impatiens*, *Pedicularis* and *Strobilanthes*. *Impatiens* is the largest with about 241 species distributed discontinuously in the Himālayas and the mountains of Peninsular India. Four of the genera are orchids, with *Dendrobium* (200 species) leading the list. *Eugenia*, *Strobilanthes\** and *Pedicularis* have undergone a revision of generic limits since Hooker wrote about them.

The proportion of monocotyledons to dicotyledons is approximately 1:2·3 in genera and 1:7 in species. There are some 100 recorded species of palms and 120 species of bamboos.

**ENDEMISM:**—It is important here to take into consideration the endemic content of the flora of India, i.e., species or genera restricted in distribution to a relatively small area. The available data are, however, confined to the dicotyledons. Nevertheless, whatever findings are available on endemism are significant in that they have a direct bearing on the floristic affinity of the Indian region with the adjoining areas of the world. Two kinds of endemics are generally recognized. The palaeo-endemics or epibiotics are the surviving remnants of once successful and widespread groups and are thus on their way to extinction. The neo-endemics are new and recent forms, still in the process of extending themselves.

Islands, far removed from other areas by the ocean, show high percentages of endemic species. High mountains and very dry deserts also serve as barriers to the free spread of plants and thus bring about isolation and endemism. The high Himālayan range is effectively isolated from Northern Asia by the dry Tibetan plateau to the north and warmer alluvial plains to the south. Consequently, the temperate and alpine vegetation of the Himālayas contain several species that have been unable to migrate either north or south. Peninsular India is bounded on the north by the broad Indo-Ganga plain, and on three sides by the sea. Both these areas have a high endemic content. For the region as a whole (including Pākistān and Burma), 61·5% of the dicotyledons are endemic. Endemic species in certain other areas are: Ceylon 30%, New Zealand 72%, Australia 80%, Hawaii Islands 82%, and California 40%. In comparison with

\*The genus *Strobilanthes* has since been split up into at least 25 genera even as it is related to Indian species alone. In fact, as now understood this genus has hardly a few species in India.

these, 61·5% is a rather high figure for a continental area like India with land connections in three directions, east, north and west. The two regions contributing most to this high endemic content are the Himālayas with 3,165 and Peninsular India with 2,045 endemic species. The number of endemic species common to both regions is 533. The Indo-Ganga plain and the desert regions of Rājasthān form an area which is extremely poor in its content of endemics. To what extent land connections between Mālaysia, India and Africa have influenced the present flora of the Deccan Peninsula is difficult to indicate with any degree of precision.

The non-endemics or "wides", totalling about 38·5% of the species, are widespread and extend to other countries also. According to Chatterjee they fall into three categories: (1) those which are chiefly tropical and subtropical and of fairly wide distribution in Asia and sometimes beyond it; (2) a considerable number extending just beyond the boundaries of our area into South-western China, Thailand, Tibet and Afghānistān; (3) cultivated and introduced plants.

The dicotyledons in India are represented by 171 families. Of these, seventy-nine families (A) contain less than 20 species each; twenty-seven (B) have 20 or more species, of which more than 50% are non-endemics or wides; and sixty-five (C) have 20 or more species of which more than 50% are endemics.

The families in category (A) are as follows, the figures in brackets indicating the number of species in each occurring in the Indian region: Dilleniaceae (15), Schisandraceae (5), Lardizabalaceae (5), Nymphaeaceae (11), Resedaceae (4), Bixaceae (1), Cochlospermaceae (1), Pittosporaceae (8), Xanthophyllaceae (7), Frankeniaceae (1), Portulacaceae (6), Tamaricaceae (8), Elatinaceae (6), Ancistrocladaceae (5), Linaceae (8), Erythroxylaceae (6), Malpighiaceae (17), Zygophyllaceae (9), Oxalidaceae (14), Simarubaceae (15), Ochnaceae (9), Burseraceae (13), Dichapetalaceae (3), Olacaceae (18), Opiliaceae (4), Staphyleaceae (4), Hippocastanaceae (2), Sabiaceae (19), Coriariaceae (1), Droseraceae (4), Hamamelidaceae (7), Haloragaceae (14), Rhizophoraceae (16), Hernandiaceae (1), Lecythidaceae (12), Crypteroniaceae (3), Sonneratiaceae (5), Passifloraceae (7), Caricaceae (1), Turneraceae (1), Daticaceae (2), Cactaceae (6), Aizoaceae (16), Alangiaceae (6), Cornaceae (12), Nyssaceae (2), Dipsacaceae (17), Stylidaceae (3), Goodeniaceae (2), Monotropaceae (3), Diapensiaceae (1), Plumbaginaceae (8), Styracaceae (9), Salvadoraceae (5), Menyanthaceae (1), Polemoniaceae (1), Hydrophyllaceae (1), Pedaliaceae (4), Plantaginaceae (13), Nyctaginaceae (8), Illecebraceae (2), Podostemaceae

(16), Nepenthaceae (1), Cytinaceae (1), Aristolochiaceae (13), Chloranthaceae (3), Myristicaceae (14), Proteaceae (7), Elaeagnaceae (12), Santalaceae (15), Balanophoraceae (6), Buxaceae (6), Ulmaceae (16), Cannabinaceae (2), Platanaceae (1), Juglandaceae (4), Myricaceae (1), Casuarinaceae (1), and Ceratophyllaceae (1).

The Dilleniaceae, Pittosporaceae and Proteaceae have their greatest development in Australia. Along with such families as the Haloragaceae, Myristicaceae and to some extent Santalaceae, they represent the Malaysian and Australian elements in the Indian flora. The occurrence in Assam of *Nepenthes*, a genus of insectivorous plants, is interesting because this area represents the northernmost limit reached by the genus. The range of its distribution indicates a certain relationship between Madagascar and Malaysia through Ceylon and the Khāsi hills of Assam. The genus *Ancistrocladus* is distributed discontinuously in West Africa on the one hand and India, Burma and Malaysia on the other.

These are two examples of a close association between the Indian and the African flora.

The Rhizophoraceae and Sonneratiaceae are predominantly mangrove families. Floristically, the Indian mangroves come under the Eastern mangrove formation extending from the east coast of Africa to Australia. The genus *Blepharistemma* is endemic to India.

The family Malpighiaceae, comprising many tropical lianas, is predominantly South American. Its presence in the Indian region (7 endemic species) and in Malaysia is remarkable; a few species are also found in Africa and Madagascar.

The Podostemaceae are remarkable plants living on rocks in rushing water. The vegetative plant body is quite unlike that of a flowering plant and recalls an alga, moss or lichen. The family is mostly tropical, and in India its chief centre of distribution is in the south with occasional species in the Khāsi hills. Of the 16 species, only 5 are wide and the rest are endemic, with 9 species endemic in South India alone.

Families like the Hamamelidaceae, Oxalidaceae, Olacaceae, Cornaceae, Dipsacaceae, Styracaceae and Elaeagnaceae show the North-east Asiatic influence on the Indian flora. The Styracaceae have three centres of distribution, two of them being in America. The third, which extends from Japan to Java, touches Sikkim and the Khāsi hills where, along with other species, we find a monotypic genus, *Parastyrax*. The Hamamelidaceae extend from North America through Japan and China to Sikkim and the Khāsi hills. The Elaeagnaceae have a much wider distribution throughout the temperate regions and have touched the North Indian region.

The following families come under category (B) : Menispermaceae (42), Violaceae (25), Polygalaceae (32), Malvaceae (111), Sterculiaceae (80), Tiliaceae (78), Elaeocarpaceae (42), Geraniaceae (28), Rutaceae (71), Aquifoliaceae (34), Sapindaceae (54), Connaraceae (20), Caesalpiniaceae (124), Mimosaceae (96), Myrtaceae (116), Lythraceae (48), Cucurbitaceae (87), Convolvulaceae (177), Solanaceae (58), Scrophulariaceae (273), Orobanchaceae (29), Bignoniaceae (31), Verbenaceae (115), Amarantaceae (48), Chenopodiaceae (40), Thymelaeaceae (22), and Moraceae (113). Most of the members of these 27 families are distributed rather widely and also include a few temperate species.

The Violaceae, Polygalaceae and Thymelaeaceae have low endemic values because of their wide distribution. Species of *Viola* occur in the mountains but *Hybanthus enneaspermus* Müll. is also met with in the plains. Species of Polygalaceae have flowers which might at first sight be mistaken for those of the Papilionaceae. In the Thymelaeaceae the genus *Daphne* is represented in the Himālayas and the Khāsi hills with some six species which are all endemic. Other genera of wide distribution, which occur in the Indian region, are *Thymelaea*, *Edgeworthia*, *Wikstroemia*, *Stellera* and *Lasiosiphon*.

The Menispermaceae, Malvaceae, Sterculiaceae, Tiliaceae, Caesalpiniaceae, Mimosaceae, Convolvulaceae and Scrophulariaceae (in large part) form a tropical group with a wide distribution, and it is to be expected that they do not have a high percentage of endemics in any particular region of India.

In the Moraceae, the tropical genus *Ficus* with a large number of species in our area (about 86) is worthy of comment. The chief centre of development of the genus may well be Malaysia and South Burma. Our two most popular species are *Ficus religiosa* L. (pipal) and *F. benghalensis* L. (banyan), both of which are held in religious veneration and are widely planted. *Ficus krishnae* C. DC. has peculiar ascidiform leaves which, according to Hindu belief, Kṛṣṇa used as cups to scoop out butter. Many species of *Ficus* begin as epiphytes on temples, old buildings, or on other plants, often between the persistent leaf bases of palms like *Phoenix*. They send down aerial roots which eventually establish contact with the soil. In this process the supporting plant is gradually killed, or the temple or building wrecked. The behaviour of the aerial roots varies. They may form buttresses radiating outward in all directions, or pillars and props supporting the horizontal branches. In the epiphytic and climbing species they may clasp and surround the supporting trunk. Both the pipal and the banyan are believed to live to a great age. In some old trees,

the main trunk may become hollow and disintegrate, leaving the crown supported like a canopy by the numerous root pillars. The famous banyan tree at the Indian Botanical Garden, Sibpur, Calcutta, is said to be only about 200 years in age, but has 666 aerial roots supporting a vast canopy nearly 335m. in circumference and looking more like a small forest than a single tree. Many Indian roads are lined with avenues of banyan trees stretching for several kilometres and forming an archway of shade from the hot tropical sun.

The inflorescence in *Ficus* is a syconium which ripens into the familiar fig. As is well known, the mode of pollination is extraordinary, there being a special insect (*Blastophaga*, a small wasp) adapted to *Ficus* flowers. Some species of *Ficus* show cauliflory, i.e., they have their inflorescences borne directly on the trunk or older branches.

Of the Myrtaceae, the most important genus found in India is *Eugenia* (including *Syzygium* and *Jambosa*) with 103 species distributed mostly in Peninsular India. Species of *Eucalyptus* found in the hill-stations of India are all introductions from Australia which, with South America, is the chief centre of development of the Myrtaceae.

The Cucurbitaceae, Solanaceae, Amaranthaceae, Chenopodiaceae and Rutaceae (in part) contain many species which have found their way to India as weeds of cultivation and have subsequently become naturalized.

The family Aquifoliaceae is represented in this country by only one genus, *Ilex*, with 34 species. It is also found in North and South America, Asia, Africa and Europe. Most of the Indian species are found also in the adjoining parts of Asia. The endemism of *Ilex* in India is 38 per cent.

The following are the 65 families falling under the Category (C) some being tropical and others temperate: Ranunculaceae (165), Magnoliaceae (36), Annonaceae (129), Berberidaceae (35), Cruciferae (178), Fumariaceae (66), Papaveraceae (45), Capparidaceae (65), Flacourtiaceae (21), Caryophyllaceae (107), Hypericaceae (26), Guttiferae (40), Ternstroemiaceae (39), Dipterocarpaceae (51), Balsaminaceae (242), Icacinaceae (25), Meliaceae (62), Celastraceae (84), Hippocrateaceae (27), Rhamnaceae (53), Ampelidaceae (69), Leeaceae (27), Aceraceae (20), Anacardiaceae (67), Papilionaceae (867), Rosaceae (257), Saxifragaceae (114), Crassulaceae (64), Melastomaceae (127), Combretaceae (52), Onagraceae (39), Samydaceae (20), Begoniaceae (71), Umbelliferae (180), Araliaceae (56), Caprifoliaceae (55), Rubiaceae (551), Valerianaceae (20), Compositae (696), Campanulaceae (71), Vacciniaceae (68),

Ericaceae (146), Primulaceae (208), Myrsinaceae (94), Sapotaceae (32), Ebenaceae (58), Symplocaceae (51), Oleaceae (97), Apocynaceae (89), Asclepiadaceae (234), Loganiaceae (40), Gentianaceae (189), Boraginaceae (145), Lentibulariaceae (30), Gesneriaceae (133), Acanthaceae (514), Labiate (421), Polygonaceae (110), Piperaceae (104), Lauraceae (172), Loranthaceae (73), Euphorbiaceae (444), Urticaceae (109), Cupuliferae (64), and Salicaceae (44).

**RANUNCULACEAE** (Buttercup family):—Most of the Indian representatives of this family are found in the Himālayas and the temperate regions of the Nilgiri hills. The main centre of development is in the temperate regions of the northern hemisphere. The degree of endemicity of certain genera in India is as follows : *Ranunculus* 36%, *Anemone* 43%, *Clematis* 76%, *Thalictrum* 79%, *Delphinium* 71% and *Aconitum* 90%. The first four of these have actinomorphic flowers and the last two have zygomorphic flowers. The low percentage of endemicity in *Ranunculus* may well be due to the weedy character of many of its members, accounting for a considerable number of species. *Actaea spicata* L. and *Cimicifuga foetida* L. are two other plants which occur in the Himālayas and also North Asia, Europe and North America. In marked contrast to these genera are those with a restricted distribution, such as *Calathodes* occurring in the Eastern Himālayas.

**MAGNOLIACEAE** (Magnolia family) :—This family, generally regarded by botanists as very primitive, shows a discontinuous distribution in the temperate and subtropical regions of the world. However, it comprises several endemic species. All the Indian species of *Illicium*, *Talauma* and *Magnolia* are endemic; and *Manglietia* and *Michelia* show an endemicity of 80 and 73 percent respectively. Thus, while the family itself is very old, many of the species have remained localized. Most of the Indian members of this family occur in the Eastern Himālayan and Assam regions.

**ANNONACEAE** (Custard-apple family):—The plants belonging to this family are confined to the Tropics, especially the rain forests of Brazil, Western Africa, Ceylon, South Burma and Malaysia. However, while the members of the Old World are usually of a climbing or straggling nature and occur in dense forests, those of tropical America are nearly all shrubby or arboreal and grow on open grassy plains. In India the Annonaceae are confined to the tropical parts of the Deccan and to Assam, and not a single species is found in the temperate regions of the Himālayas. Sixty per cent of the Indian species are endemic. *Polyalthia*, *Artobotrys* and *Annona* spp. (custard-apple, *sītāphal*, *rāmphal*) are familiar in India. The last mentioned are introductions.

**BERBERIDACEAE** (Barberry family):—The genera *Berberis* and *Mahonia* are interesting from the point of view of endemism. They extend from North Asia and Northern Europe to North America and to some extent to South America. There is a very large number of endemics, for 97 per cent of the Indian species are not found elsewhere. The general habit of *Berberis* suggests xerophytic conditions; yet in India most species of the genus are found in the humid Central and Eastern Himālayas. Very few are found in the dry North-west Himālayas. The Indian species of *Berberis* and *Mahonia* show a relationship with the Chinese species of Yunnan and adjoining areas.

**CRUCIFERAE** (Mustard family):—This family finds its chief development in the Western Himālayas and the plains of North-west India. There are a few species in the Eastern Himālayas and the plains of North India, but in the whole of South India there are only the cultivated species and a few weeds associated with them. A much greater concentration occurs in the Mediterranean region, to which the Indian area is possibly connected through Afghānistān and Irān. Some of the common plants of this family, which are found extending from the Mediterranean region to India via West Asia, are as follows : *Matthiola odoratissima* R. Br., *Nasturtium officinale* R. Br., *Cardamine impatiens* L., and species of *Sisymbrium* and *Capsella bursa-pastoris* Medic. The total endemic percentage in India is 56, which is rather high for a widespread family like Cruciferae. Some genera show particularly high endemism in India, e.g., *Draba* 83%, *Cardamine* 70%, and *Arabis* 71%. Almost all of these occur in high alpine zones.

**FUMARIACEAE**:—*Corydalis* is the most important genus in the Western Himālayan and West Chinese areas. 48 species out of 61 are endemic, which brings the percentage to 79. There is evidence to suggest that the main development of *Corydalis* has taken place in Central Asia and the Himālayas, from where it has migrated east and west. A somewhat localized genus, *Dactylicapnos* Wall. (syn. *Dicentra*), ranges from Kumaun to the Khāsi hills and Yunnan. *Hypecoum* and *Fumaria* seem to have come to India from the West. *Fumaria indica* Pugsley is found as a weed of cultivation in several parts of India.

**PAPAVERACEAE** (Poppy family):—There are 26 species of the genus *Meconopsis*, and all except one are endemic—that brings the figure of endemics to 96 per cent. *Argemone mexicana* L. (Mexican poppy), a native of tropical America, has become widely naturalized in the Indian plains. *A. ochroleuca* Sweet sub-sp. *ochroleuca* is less common but this too has established itself in some parts of India.

CAPPARIDACEAE (Caper family) :—This family, which is mainly tropical and subtropical, has a relatively smaller endemic figure of 54 per cent. *Capparis* is the largest genus with 38 species. The family is characteristic of the drier western and southern parts of the country and has a similar distribution in Africa and West Asia. *Gynandropsis*, *Cleome*, *Cadaba*, and *Crataeva* are other familiar genera.

FLACOURTIACEAE (Flacourtie family) :—The Indian members are on the whole related to the Malaysian group, except perhaps the genus *Gynocardia*, which is endemic in Sikkim and Assam. Seeds of *Hydnocarpus Kurzii* Warb yield the Chaulmoogra oil useful in the treatment of leprosy.

CARYOPHYLLACEAE (Pink family) :—This family has about 57 per cent endemicity in India, chiefly in the Himālayas where it is mostly found in the temperate and alpine zones. The Mediterranean region seems to be the chief centre of distribution, and some of the species common with India through Western Asia are as follows : *Dianthus caryophyllus* L., *D. fimbriatus* Biebr., *Silene conoidea* L., *S. araneosa* C. Koch., *Stellaria aquatica* Scop., *S. bulbosa* Wulf., *Cerastium trigynum* Vill., *C. dahuricum* Fisch., *C. vulgatum* L., *Arenaria serpyllifolia* L., *Drymaria cordata* Willd. and *Polycarpea spicata* W. et A., *Stellaria media* Cyrill, and *Spergula arvensis* L. are two cosmopolitan weeds which occur in several parts of the country.

GUTTIFERAE (Garcinia family) :—*Poeciloneuron* is endemic in South India. *Garcinia*, *Calophyllum*, *Kayea* and *Mesua* extend from tropical Africa to Malaysia. The general endemic percentage for the family in India is 50, and most of the wides are in Malaysia. This suggests that a South East Asian influence is responsible for the Guttiferae in our area.

TERNSTROEMIACEAE (Tea family) :—This family, sometimes called Theaceae, is discontinuously distributed in tropical Asia and tropical America. Its representatives are almost wanting in Africa and absent from Australia. The endemic percentage of the Indian species is 54. *Camellia sinensis* O. Ktze. is the tea plant of commerce, extensively grown in the North-eastern and the South-western parts of the country.

DIPTEROCARPACEAE (Sal family) :—This is a tropical family characteristic of the Indo-Malayan region, but a few genera also occur exclusively in South India and Ceylon. They are very useful forest trees, the most familiar of which is the sal (*Shorea robusta* Gaertn. f.).

BALSAMINACEAE (Balsam family) :—As already mentioned, *Impatiens* is the largest genus of flowering plants in the Indian

region, with about 241 species. The greatest concentration of the species is in the humid Eastern Himālayas and Burma; a large assemblage is also found in South India and Ceylon. *Impatiens* provides a striking example in this country of discontinuous distribution of a taxon; not a single species is common to the Himālayas and South India, although each of these areas contains a very large number of forms. The genus as such seems to be a very old one and the two groups, the Himālayan and South Indian, must have been separated from each other for a very long time and developed in mutual isolation. The number of endemic species of *Impatiens* in India is 220 out of 241, bringing the endemic percentage to 91.

**CELASTRACEAE** :—This family is distributed in the lower hills and the plains of Peninsular India, Assam and the Eastern Himālayas, with a high concentration in South India. The genus *Euonymus* has 27 endemic species out of 32, bringing the endemic percentage to 84. The majority of species of *Gymnosporia* are endemic in South India and the Eastern Himālayas.

**PAPILIONACEAE** (Pea family) :—This is the largest family of dicotyledons in India. The total number of species is at least 867 including 372 endemics and an endemic percentage of 57. The plants are of varied habit. Thus, the arborescent *Dalbergia* contrasts strongly with the small herbaceous species found in the Himālayas. *Crotalaria* and *Tephrosia* have their greatest development in South India. *Millettia* is distributed mainly in Assam and North Burma where as many as 16 species are found as endemics. *Caragana* and *Astragalus* are well developed in the dry Western Himālayas. The endemic percentage of *Astragalus* in the Himālayas is 75 and most of the species are found at high altitudes.

The family belongs predominantly to drier regions and suffers a marked diminution when we come to areas of heavy rainfall. The Assam species show a relationship with those of South East Asia; the Himālayan, with West and North Asia ; and the South and West Indian with North Africa.

**ROSACEAE** (Rose family) :—This is a family chiefly of the Northern hemisphere. In India it is mainly distributed in the temperate regions of the Himālayas and other mountains. The total number of species is 257 with 179 endemics so that the endemic percentage is 70. Most of the species are found in the alpine regions of the Himālayas, there being only a few in South India and the Indo-Ganga plain. Representative genera of the Northwestern Himālayas are *Prunus*, *Rubus*, *Rosa*, *Potentilla* and *Cotoneaster*, while those of the Eastern Himālayas are *Eriobotrya*, *Photinia* and *Pygeum*.

SAXIFRAGACEAE (Hydrangea family):—*Saxifraga* is the most important genus and is chiefly found in the temperate and alpine parts of the Eastern Himālayas. Of its 58 species, 51 are endemic, giving a percentage of 88. The genus is not found in other areas outside the Himālayas. The general endemic figure for the family in India is 76 per cent.

RUBIACEAE (Coffee family) :—One of the largest among the dicotyledons, this family is well represented in Peninsular India, Assam and the subtropical regions of the Himālayas. The main centre of development for our country is in South India and Ceylon, and to a lesser extent in the rain forests of Assam. The total number of Indian species is 551, of which 364 are endemic, the percentage thus coming to 67.

The coffee plant, *Coffea arabica* L., a native of Africa, is grown in the hills of South India. *Cinchona*, a native of South America, has been introduced in recent times into India and is grown in North-eastern and South India.

COMPOSITAE (Sunflower family):—This family, the largest of the flowering plants, comprises about 700 species in India, but half of this number are wide and the endemic percentage is only about 52. The plants range from the tropical region to the high alpines, and in their species content South India and the Himālayas are approximately equivalent.

The South Indian Compositae generally recall those of Africa, and the Himālayan recall those of North Asia and China. The Indo-Ganga plain chiefly has species of very wide distribution. Several members are grown as ornamentals. The flowers of *Carthamus tinctorius* L. (safflower) are used in dyeing. Attempts are being made to grow *Chrysanthemum cinerariaefolium* Vis., source of the contact insecticide pyrethrum.

VACCINIACEAE (Blueberry family):—The Eastern Himālayas and Assam are the richest in Vacciniaceae. Out of a total of 68 species, 64 are endemic in these areas and in Burma. *Agapetes* is the most common genus.

ERICACEAE (Rhododendron family):—*Rhododendron* is a conspicuous element of the Eastern Himālayan temperate and alpine zones. A few species extend to the North-western Himālayas, to the Khāsi hills and even to the Nilgiris. Out of a total of 126 species from India and Burma, 64 are endemic in the Himālayas and 44 in Upper Burma. The endemic ratio is as high as 90 per cent.

PRIMULACEAE (Primrose family):—The two chief genera of this family, *Primula* and *Androsace*, are found only in the Himālayas.

About 148 species of *Primula* seem to be endemic to the Himālayas, giving the high percentage of 91. *Androsace* is more prominent in the dry north-west of the Himālayas. *Omphalogramma* and the monotypic genus *Bryocarpum* are confined to the Eastern Himālayas and adjoining areas of China and Burma.

**ASCLEPIADACEAE** (Milkweed family):—The total number of species is estimated to be 234. Of these 172 are endemic, which gives a percentage endemic value of 73. The genus *Caralluma* is best developed in Africa and Madagascar and its occurrence in India is an example of an African element in our flora. *Ceropegia* has 40 species in India; of these 26 are endemic in South India. *Hoya*, on the other hand, is chiefly found in the Himālayas. *Utreria*, an arborescent genus with only one species, is endemic in South India. *Dischidia rafflesiana* Wall. occurs in Assam and is epiphytic like other species of this genus. *Calotropis procera* L. and *C. gigantea* L. are widespread weeds of drier areas.

**GESNERIACEAE**:—The family is found chiefly in the subtropical regions of the Eastern Himālayas, Khāsi hills, Burma and Malaysia. Out of 27 genera, 7 are endemic. Most of the species occur at moderate elevations in the more moist hills (914 to 1,524 m.). *Didissandra* and *Aeschynanthus* are the only genera found at higher altitudes. Species of the latter often occur as epiphytes.

**ACANTHACEAE**:—India is one of the richest regions for this family. There are 80 genera and 514 species occurring chiefly in the tropical and subtropical regions. They are particularly abundant in the Peninsular region, where as many as 188 species are endemic. The number of endemic genera is 14, and the general endemic figure for the family is 82 per cent. In the genus *Strobilanthes* (many of the species have recently been segregated into separate genera) 146 species are endemic out of a total of 152. Several species are characterized by a gregarious flowering at definite intervals. *S. kunthianus* T. And. (now *Phlebophyllum kunthianum* Nees) flowers once every 12 years in the Nilgiris.

**LABIATE** (Mint family):—This is a useful family because of the volatile aromatic oils that many of its members contain. *Ocimum sanctum* L. (*tulasī*) is held in religious veneration and is commonly grown in Hindu homes. *Mentha* (*pudinā*, mint) is a culinary herb prized for its flavour and aroma. Oils and perfume are obtained from *Pogostemon* (patchouly), *Lavandula* (lavender), etc.

There are 69 genera and 421 species occurring chiefly in comparatively dry areas and moderate altitudes ; of these 261 are endemic. The two chief centres of concentration are the Deccan and North-western India. The South Indian development of the

Labiatae is very remarkable, recalling the Balsaminaceae. But while the latter have mostly developed in the moist Malabār region, the Labiate have multiplied in the dry eastern half of South India. The following genera show high endemicity: *Plectranthus*, *Anisochilus*, *Pogostemon*, *Nepeta*, *Leucas*, *Elsholtzia*, *Salvia*, *Dracocephalum*, *Phlomis* and *Gomphostemma*. *Anisochilus*, *Pogostemon* and *Leucas* are well represented in South India, whereas *Nepeta*, *Elsholtzia*, *Salvia*, *Dracocephalum* and *Phlomis* are better developed in the Himālayas.

POLYGONACEAE (Buckwheat family):—The genus *Polygonum* contains 88 species in the Indian area; 78 are endemic. Almost all the species found in the hills show high endemism and some of them cover a great range of altitude. *Polygonum viviparum* L. shows the greatest vertical range in distribution and is found from 1,524 to 5,484 m. In contrast to this *P. perpusillum* Hook. f. and *P. hookeri* Meissn. have a very restricted range in the Himālayas.

*Antigonon*, *Muehlenbeckia* and *Coccoloba* are cultivated as ornamentals in Indian gardens. However, none of them is indigenous to this country.

LORANTHACEAE (Mistletoe family):—This is a family of tropical and subtropical semi-parasites. In the Old World the greatest development is seen in the Malaysian region. Of the 73 species in the Indian region, 47 are endemic. The chief concentration is in Malabār and in the moist rain forests of Assam.

EUPHORBIACEAE (Castor family):—Plants of this family are widely distributed in the tropical and subtropical regions of the world. The major concentration is in the Deccan Peninsula. Only 5 out of the 70 genera are endemic.

The genus *Euphorbia* shows a strong representation and 41 species are endemic out of a total of 63 which seem to be rather well balanced between Peninsular India and the Himālayas. Several of the Himālayan species are found at high altitudes, extending even to the alpine zone. Some of the species are fleshy and resemble cacti in their vegetative habit. However, they can be readily distinguished by their stipular thorns which occur in pairs at the nodes, as also by the presence of latex. Similar fleshy euphorbias occur in Africa.

The rubber plant, *Hevea brasiliensis* Müll.-Arg. is the most useful member of this family and a native of tropical America. It is grown on a fair scale in the Malabār region. Another useful introduction is *Manihot esculenta* (tapioca, cassava), which is also a native of tropical America. The castor, *Ricinus communis* L., is a native of tropical Africa but is now more or less naturalized in this country. *Emblica officinalis* Gaertn. (*āmlā*), is also a very

useful plant, its fruits being a rich source of vitamin C. *Poinsettia* and *Codiaeum* (popularly called croton) are widely grown as ornamentals.

A comparable study of the monocotyledons is not available so far.\* About 38 families are represented in India. Of these, Orchidaceae (c. 1,600 species), Gramineae (c. 750 species) and Cyperaceae (c. 377 species) are the most important. Further, the Orchidaceae is the largest family of flowering plants in the Indian region. The Liliaceae, Araceae and Palmaceae have about a 100 species each, or more; the Commelinaceae have about 70 and the Juncaceae about 30. Most of the other families of monocotyledons have less than 30 species in this country. Of course, a few are very small families anywhere in the world and consist of only one genus and one species.

**HYDROCHARITACEAE** (Frogs-bit family) :—There are 8 genera and 12 species in India, all being submerged aquatics. *Hydrilla*, *Vallisneria*, *Lagarosiphon*, *Blyxa* and *Ottelia* occur in fresh waters; *Enhalus* and *Halophila* are marine plants.

**BURMANNIACEAE** :—*Burmannia* is represented by about 6 species which are chiefly saprophytic. They occur mainly in South India.

**ORCHIDACEAE** (Orchid family):—As already indicated, the Orchidaceae are represented by about 1,600 species in the Indian region. The largest number of species occur in the Eastern Himālayan and Assam regions. *Dendrobium*, *Bulbophyllum*, *Eria* and *Habenaria* have each about a hundred or more species in the Indian region.

The family is of great biological interest for several reasons. It is one of the largest families of flowering plants with 10,000—15,000 species widely distributed but especially abundant in the Tropics, where most of them occur as epiphytes in the evergreen rain forests. Some are saprophytes like *Neottia*, *Gastrodia* and *Epipogium* with fungi associated with their roots as mycorrhiza. Several of the epiphytes have aerial roots with the velamen helpful in water absorption. The flowers of orchids show remarkable adaptations for pollination by insects. Some of them are so specialized for insects of certain kinds that in their absence pollination fails to occur. However, using artificial methods, several orchids belonging to different genera can be readily hybridized. Thus, *Brassocattlaelia* is a multigeneric hybrid involving three genera, *Brassavola*, *Cattleya* and *Laelia*.

\* Chatterjee (1960) estimates that about 1,000 species of monocotyledons are endemic in the Himālayas and about 500 in South India.

Each fertile orchid fruit produces a dust-like mass of an enormous number of exceedingly small and light seeds which easily become wind-borne and hence, among other causes, the epiphytic habit of so many orchids.

Because of their beautiful and gorgeous flowers, the orchids are highly prized favourites in horticulture all over the world. But the numerous wild orchids of India have not so far received, in their own country, the attention they deserve. It may be hoped that interest will be stimulated with the establishment of the National Orchidarium at Shillong.

**MUSACEAE** (Banana family):—This family belongs to the Tropics of the Old World. *Musa* is a useful genus, the banana (*Musa paradisiaca* L.) being one of the most important food plants which is widely grown in the warmer parts of the country. The cultivated varieties are usually triploid and produce no seeds. The plant is a large herb with rhizomes which are used for vegetative propagation. The inflorescence springs from the rhizome underground and emerges at the top of a false aerial stem formed mainly of the sheaths of the large leaves. The blades of the leaves are readily torn from the edges and thus wind and rain soon reduce them to a ragged condition.

**ZINGIBERACEAE** (Ginger family):—The plants of this family are perennial herbs, usually with sympodial fleshy tuberous rhizomes. The family is chiefly Indo-Malayan and is well represented in the Himalayas. *Hitchenia* with 4 species is endemic to India. The rhizomes of *Curcuma* (turmeric and zedoary) and *Zingiber* (ginger) are of economic value. *Elettaria cardamomum* Maton yields the cardamom of commerce and is cultivated in the mountains of South India. The fruits of *Amomum* are also used as flavouring material. Other genera of the family found in India are: *Globba*, *Hedychium*, *Kaempferia*, *Alpinia*, *Costus* and *Roscoea*.

**CANNACEAE** (Canna family):—*Canna*, the only genus of this family, is represented by a few species in India which are doubtfully indigenous. The family is essentially tropical and subtropical American. Several varieties of hybrid origin are garden favourites.

**MARANTACEAE** (Arrowroot family):—*Phrynium* and *Clinogyne* are the only Indian genera of this predominantly American family.

**IRIDACEAE** (Iris family):—About a dozen species of *Iris*, which is chiefly north temperate in distribution, occur in the Himalayas. *Crocus sativa* L. is cultivated in Kashmir for saffron, which is composed of the dried stigmas of this plant and is used for flavouring and colouring food. *Iris*, *Gladiolus*, *Freesia* and *Belamcanda* are cultivated as ornamentals.

HYPOXIDACEAE:—*Hypoxis aurea* Lour. occurs in the hills and mountains of India. There are half a dozen species of *Curculigo*.

AMARYLLIDACEAE (Amaryllis family):—About a dozen species of *Crinum* and half a dozen of *Pancratium* occur in India. *Crinum*, *Pancratium*, *Zephyranthes* and *Narcissus* are cultivated in gardens.

AGAVACEAE:—Several species of *Agave*, among them *A. Sisalana* Perr. and *A. Vera-Cruz* Mill., have been introduced and naturalized in some parts of India. Ornamental varieties of this genus as well as of *Yucca* and *Dracaena* are planted in gardens.

TACCACEAE:—Three species of *Tacca* occur in the country.

DIOSCOREACEAE (Yam family):—Some 16 species of *Dioscorea* and one species of *Trichopus* are the only representatives of this family in India.

STEMONACEAE:—Two species of *Stemona* and one of *Stichoneuron* occur in India. The family as a whole consists of only three genera.

LILIACEAE (Lily family):—This is a large family. There are about 160 species in India, mostly occurring in the Himalayas. Many of the species are bulbous, scapigerous herbs. Species of *Smilax* are tendril climbers. *Asphodelus tenuifolius* Cav. is a winter weed in the plains. The large orange red flowers of *Gloriosa superba* L. are so beautiful that this plant is frequently grown in gardens. Onion (*Allium cepa* L.) and garlic (*Allium sativum* L.) are widely cultivated for their bulbs. The corms of *Colchicum autumnale* L. yield the alkaloid colchicine. Several other plants of this family are garden favourites.

PONTEDERIACEAE:—This is a small family of aquatics, of which *Monochoria* is represented in this country by two species. *Eichhornia crassipes* Solms is an introduced plant now naturalized in this country (see also p. 225).

PHYLDRACEAE:—*Phylidrum lanuginosum* Banks occurs in the Andaman Islands eastward to Burma and Malaysia.

XYRIDACEAE:—Half a dozen species of *Xyris* occur in India.

COMMELINACEAE:—This family is predominantly tropical and subtropical. Nearly 70 species occur in this country; some 28 of them belong to *Aneilema* and 20 to *Commelina*. *Cyanotis* is another large genus of the family. *Commelina benghalensis* L., one of the commonest species, has subterranean cleistogamous flowers. *Rhoeo*, *Tradescantia* and *Zebrina*, all from the New World, are cultivated in gardens.

FLAGELLARIACEAE:—*Flagellaria indica* L. occurs throughout India. It climbs by means of its leaf tips.

JUNCACEAE (Rush family):—This is a family of the temperate regions. As might be expected, it is found in India in damp and

cold places, mostly in the Himālayas. There are about 26 species of *Juncus* and 4 species of *Luzula*. *Juncus bufonius* L. and *J. prismatocarpus* R. Br. occur also in the plains of Northern India.

**PALMACEAE** (Palm family):—The palms are a characteristic feature of tropical vegetation and landscape. They are of great economic importance, particularly in the Tropics. There are about 100 species of this family in India. While most of them have the distinctive palm form, some are climbers or scramblers, like *Calamus* (the largest genus of the family) and *Plectocomia*. In these the stem may attain an immense length and the leaves are provided with hooks or spines by which the stem is able to take hold of the surrounding vegetation. The rattan canes, used for making chair bottoms, baskets and cables are the stripped stems of *Calamus*. *Nipa fruticans* Wurmb. occurs in the tidal forests of the Sundarbans in West Bengal. *Plectocomia himalayana* Griff. and *Trachycarpus martiana* Wendl. occur up to 1,520-2,188 m. in the Eastern Himālayas. The coconut (*Cocos nucifera* L.) and the betel-nut palm (*Areca catechu* L.) are cultivated in the hot damp regions of India, the former especially near the sea. The date palm (*Phoenix dactylifera* L.) has been introduced in North-western India. The palmyra palm (*Borassus flabellifer* L.) is cultivated throughout the plains of this country. The talipot palm (*Corypha*) is the most majestic palm of India but it is rare and confined in distribution. Many other palms are grown in gardens for ornamental purposes.

The palms are of considerable geological age. A number of palm genera are endemic with narrow ranges of distribution. The endemism of the species is even more marked; it has been estimated that 95 per cent of all the species in this family are narrowly distributed. In some of the tropical islands, all the native species are endemic and even in some continental regions the percentage is over 90. In a letter to Darwin, Hooker described the Palmaceae as "a very ancient group and much dislocated, structurally and geographically".

**PANDANACEAE** (Screw-pine family):—They are woody plants often with a palm-like habit. As already indicated on page 167 the unisexual nature of the flowers of *Pandanus* seems to have been sensed by the ancient Hindus. There are about 6 species of the genus in India and one of *Freyinetia*. The sweetly scented flowers and spathes are used for ornament and as a source of perfume.

**TYPHACEAE** (Cat's-tail family):—*Typha*, the only genus of this small family, is represented by three species, all grass-like marsh herbs with spongy leaves.

**SPARGANIACEAE** :—This, like the above, has a single genus, *Sparganium*. There are two species of it in North-western India and the Eastern Himālayas.

**ARACEAE** (Aroid family) :—The aroids are represented by more than a 100 species in India. The flowers are unisexual or bisexual and borne typically on a cylindrical spadix which is enclosed by a green or coloured spathe. While most of the species are terrestrial herbs, a few are climbers like *Pothos*, or epiphytes with aerial roots. *Pistia* is a floating aquatic, and *Acorus* and *Cryptocoryne* are usually marsh plants. There are several species of *Arisaema* (cobra plant, jack-in-the-pulpit) in the Himālayas and mountains of South India. *Lagenandra* with five species is endemic to South India and Ceylon. The corm-like rhizomes of *Amorphophallus*, *Colocasia* and *Alocasia* are edible. The rhizome of *Acorus* is aromatic, and is useful in medicine and for flavouring.

**LEMNACEAE** (Duckweed family) :—These are small, floating water plants with a thalloid plant body which is often purplish beneath. The flowers are minute and unisexual and located in grooves under the edge. The plants usually propagate themselves vegetatively and so rapidly as to cover the entire surface of the water with a dense green carpet-like mass. *Spirodela* and *Lemna* have roots; species of *Wolffia*, the smallest of flowering plants, are rootless.

**TRIURIDACEAE** :—Two species of *Sciaphila* are reported, one from Kerala and the other from Assam. They are slender saprophytes with scale leaves.

**ALISMACEAE** :—These are marsh or water plants of various habits. *Alisma*, *Limnophyton*, *Sagittaria* and *Wisneria* are represented by a few species in India.

**BUTOMACEAE** :—Like the Alismaceae, these are water or marsh plants. *Butomus* and *Butomopsis* are two well known genera. The latter should perhaps be transferred to the Alismaceae.

**SCHEUCHZERIACEAE** :—Two species of *Triglochin* occur in temperate and alpine Himālayas. They are scapigerous marsh herbs with a rush-like appearance.

**APONOGETONACEAE** :—*Apdrogeton*, the only genus of the family, is represented by four species of which *A. monostachyon* L. and *A. crispum* Thunb. are widespread, scapigerous plants with tuberous rootstocks.

**POTAMOGETONACEAE** :—They are all partly or wholly submerged aquatic plants. *Potamogeton* is represented by about 10 species occurring in fresh waters. *Ruppia* is found in brackish water and *Cymodocea* is marine.

ZANNICHELLIACEAE:—The single genus *Zannichellia* has two species, both cosmopolitan, and occurring in fresh or brackish waters.

NAJADACEAE:—*Najas*, the only genus of this family, is represented by four species, but this number needs revision. They are submerged aquatic plants of fresh or brackish waters.

ERIOCAULACEAE:—There are about 34 species of *Eriocaulon* reported from India. They are marsh or aquatic scapigerous herbs. This family is especially well developed in South America.

CYPERACEAE (Sedge family):—Sedges are grass-like plants, chiefly of marshy habitats. Like grasses, they are also very widely distributed throughout the world but with a narrower ecological range, being a counterpart as it were of the Gramineae in rather damper conditions. More than 377 species occur in India; nearly 130 of them belong to the genus *Carex*. They occur chiefly in the Himālayas, some at very high alpine altitudes. Of *Cyperus*, which is mainly tropical and the second largest genus, there are about 60 species, and of *Fimbristylis* about 50 species. From the pith in the culms of *Cyperus papyrus* L. (paper-reed), a riverside plant, the Egyptians, as early as 2400 B.C. made the ancient writing paper, papyrus. The rhizomes and root tubers of several species of *Cyperus* are edible and the stems are used in basketry; but, on the whole, the family is of little economic value.

GRAMINEAE (Grass family):—One of the largest families of flowering plants, the Gramineae is also the most widely distributed in all regions of the globe. In temperate regions, the grasses are a conspicuous element of the vegetation, forming grasslands, called prairies or steppes. While most grasses are herbaceous, the bamboos are woody and may attain a size of as much as 30 m. Grasses are readily recognized but are difficult to identify botanically. There are about 750 species in India. As regards usefulness to man and animals, the pride of place should certainly go to the grasses. The following quotation from Pohl (1954) aptly summarizes their importance: “Of all the world’s flowering plants, the grasses are undoubtedly the most important to man. They contribute tremendously to the earth’s green mantle of vegetation; they are the source of the principal foods of man and his domestic animals. Without the grasses, agriculture would be virtually impossible: grain, sugar, syrup, spice, paper, perfume, pasture, oil and timber, and a thousand other items of daily use are products of various grasses. They hold the hills, plains and mountains against the destructive erosive forces of wind and water. In the end, they form the sod that covers the sleeping dead.”

#### 4. *Gymnosperms.*

Out of a total of about 65 living genera of gymnosperms only 14 occur in India. This is because they are mainly temperate plants and in this country only the Himālayas afford the main temperate region. Here they grow luxuriantly and some of them form extensive forests. Since the group is economically important and mostly consists of trees, it has received considerable attention at the hands of silviculturists.

Of the six living orders, four—Cycadales, Coniferales, Ephedrales and Gnetales—are represented in India, the Coniferales being the dominant order. *Ginkgo biloba* L., the sole living representative of the Ginkgoales, is Chinese although a few trees are being grown in scattered places having a mild climate.

**CYCADALES** :—*Cycas* is the only genus of this order in India. There are four species—*C. beddomei* Dyer, *C. circinalis* L., *C. pectinata* Griff. and *C. rumphii* Miq. *C. beddomei* is restricted to the dry hills of the Cuddapah District of Andhra Pradesh. *C. circinalis* is widely distributed in the dry deciduous forests of Southern India. Sago is extracted from its stem and seeds. *C. pectinata* is found in several parts of Eastern India and *C. rumphii* in the Andaman and Nicobar Islands. *C. revoluta* Thunb., a Japanese species, is frequently cultivated as an ornamental plant in North India. It is vegetatively propagated and generally the plants are all female.

**CONIFERALES** :—The order is represented by 11 genera—*Abies*, *Cedrus*, *Cephalotaxus*, *Cupressus*, *Juniperus*, *Larix*, *Picea*, *Pinus*, *Podocarpus*, *Taxus* and *Tsuga*. Except *Podocarpus* all the other conifers are restricted to the Himālayas. There is a clear demarcation between the West and East Himālayan conifers. There are only a few of them which occur in both regions. Their distribution is mainly governed by altitude and they grow in very characteristic formations. For example at 2,500 m. above sea level in the Western Himālayas, the tree community chiefly comprises *Cedrus deodara* Loud., *Pinus wallichiana* A. B. Jack., and *Abies pindrow* Royle along with some angiosperms like the oaks. At 1,000 m. the dominant conifer is *Pinus roxburghii* Sarg.

*Abies* has four species. Of these *A. pindrow* Royle and *A. spectabilis* Spach grow in the Western Himālayas and *A. densa* Griff. and *A. delavayi* Franchet in the Eastern Himālayas. They form extensive forests at high altitudes, occurring above 2,300 m. They yield a useful light wood which is used for making sleepers.

*Cedrus* comprises a single species, *C. deodara* Loud., occurring gregariously in the Western Himālayas at 1,200-3,300 m. At places it attains gigantic dimensions, and the oldest known tree exceeds 704 years in age. As ornamentals there are few trees in the world which compare with deodar. It is the strongest of Indian coniferous timbers being very resistant to white ants and fungi. *Cupressus torulosa* D. Don is a common associate of deodar but it does not occur in abundance.

There are two species of *Cephalotaxus*—*C. mannii* Hk.f. and *C. griffithii* Hk.f.—both being small trees of the evergreen forests of the eastern Himālayas.

The genus *Juniperus* comprises six species—*J. communis* L., *J. coxii* A. B. Jack., *J. macropoda* Boiss., *J. recurva* Buch.-Ham., *J. squamata* Buch.-Ham. and *J. wallichiana* Hk.f. ex Parl. which are found in the inner valleys and higher ranges, above the tree limit. They are small trees or shrubs and the twigs of many of them are burnt for incense in temples.

*Larix* has one species, *L. griffithiana* Hort. ex Carr. growing as a tall tree in Eastern Nepāl, Sikkim and Bhutān at 2,400-3,650 m. It is the only deciduous conifer of our country.

*Picea smithiana* Boiss. is the West Himālayan spruce while *P. spinulosa* Henry belongs to the Eastern Himālayas. The former is a frequent associate of *Abies pindrow* Royle and attains a height of nearly 60 m. Its wood is used for cheap joinery but the bulk of the supply is utilized by the railways for treated sleepers.

*Pinus* is the most important genus from the point of view of forestry. Three species—*P. gerardiana* Wall. ex Lamb., *P. roxburghii* Sarg. and *P. wallichiana* A. B. Jack.—occur in the Western Himālayas and two species—*P. insularis* Endl. and *P. armandi* Franchet—are found in the Eastern Himālayas. *P. roxburghii* is the conifer of lower altitudes. It occurs in great quantities and is put to a variety of uses. Cheap joinery in North India mostly depends on its timber. The tree is also extensively tapped for turpentine which is distilled to obtain the turpentine oil and rosin. *P. wallichiana* is an associate of *Cedrus deodara* and *Abies pindrow*. Its wood is superior to that of *P. roxburghii*. *P. gerardiana* grows in the dry inner valleys of the Western Himālayas and is well known for its edible seeds (*Chilgoza*) which are very nutritious.

*Podocarpus neriifolius* D. Don is a graceful tree occurring up to 900 m. in the Eastern Himālayas and the Andamans. It is an inhabitant of the evergreen climax forests of these regions. *P. wallichianus* Presl. has a discontinuous distribution. It occurs from Nilgiris southwards and in Assam.

*Taxus baccata* L. grows in moist shady places above 1,800 m. all along the Himālayas, Khāsi-Jaintia hills and Nāga hills. The wood is very durable but is not available in large quantities.

*Tsuga dumosa* Eichler is a tall pyramidal tree with gracefully drooping branches distributed in Central and Eastern Himālayas chiefly at 2,440-3,050 m. Its common associates are the spruce and the fir.

Mention may also be made here of the many introduced conifers which have now become naturalized. *Cryptomeria japonica* D. Don was introduced by seeds from Japan around the middle of the 19th century. Its cultivation was started in Darjeeling which has now extensive forests of this tree. Here it grows quickly and yields a valuable light wood. It has also become naturalized in the Western Himālayas. *Cupressus funebris* Endl. is a Chinese species and is frequently planted in the hills in graveyards and cemeteries due to its "weeping" habit. *C. cashmeriana* Royle ex Carr. comes from Tibet and is now widely cultivated in India. It also has a fast growth rate. *Callitris cupressiformis* Vent. was introduced from Australia into the Nilgiris in 1885. It is now the finest hedge plant of this area. *Thuja orientalis* L. has a vertical arrangement of its branches and is a common ornamental shrub in the plains of North India.

**EPHEDRALES** :—*Ephedra*, the sole representative of the Ephedrales, contains erect or climbing shrubs or perennial herbs. The genus has become important in recent times because of the drug ephedrine which is extracted from some species and is used against asthma and other bronchial troubles. *E. foliata* Boiss. et Kotschy, *E. gerardiana* Wall., *E. intermedia* Schrenk et Mey., *E. nebrodensis* Tineo, *E. regeliana* Florin and *E. saxatilis* Royle ex Florin occur in India. *E. foliata* is a scrambling shrub found in the drier parts of Rājasthān while the other species occur at high altitudes in the Himālayas. *E. gerardiana* and *E. nebrodensis* contain good quantities of ephedrine and are being commercially exploited for this purpose.

**GNETALES** :—The order Gnetales is represented by the genus *Gnetum* with five species—*G. contractum* Mgf., *G. gnemon* L., *G. latifolium* Bl., *G. montanum* Mgf. and *G. ula* Brongn. Of these *G. ula* is the most common. This is an extensive woody climber occurring in the evergreen forests of the Western Ghāts, Andhra Pradesh and Orissa. *G. contractum* is a scandent shrub occurring in Kerala and the Nilgiri hills. *G. gnemon* is an erect shrub found in the rain forests of Eastern India. *G. montanum* grows wild in Assam, Sikkim, and parts of Orissa, and *G. latifolium* is known from the Andamans.

The gymnosperm flora of India is limited and fairly well known but details of their structure and life history have not been worked in all cases.

### 5. *Pteridophytes*

The pteridophytes include a vast assemblage of elegant plants distributed throughout the globe, although best represented in the mountains of the Tropics. Their immense variety and very ancient lineage—going back to the Palaeozoic era—have made them a very interesting group for students of evolution.

The Himālayas, particularly the wetter eastern areas, abound in the richness and variety of ferns and their allies. As one proceeds westwards, the number of species and individuals dwindle and only a few species are found in the extreme western parts of the Himālayan range such as Kulu and Kashmīr. In Rājasthān and Saurāshtra the fern flora is insignificant. Along the Western Ghāts, due to higher precipitation, a rich variety of ferns are met with.

In the year 1863, Beddome published a well illustrated volume on *The Ferns of Southern India*, followed by volumes entitled *Handbook to the Ferns of British India* in 1865-1870 and 1876. Later (1883), he summed up all the information in his *Handbook to the Ferns of British India, Ceylon and the Malay Peninsula*, and added a supplement in 1892. Clarke (1880) reviewed the ferns of Northern India and Hope (1899-1902) published a series of papers on *The Ferns of North-Western Himalayas*. Blatter & d'Almeida (1922) wrote on the fern flora of Bombay. Stewart (1942, 1945) gave an account of the ferns of Mussoorie, Dehra Dūn and Kashmīr. Mehra (1939) described the ferns of Mussoorie, and Pani-grahi (1960, 1961) of Eastern India. Alston (1948) enumerated 58 species of the genus *Selaginella* from India and 8 more have been recorded recently from the eastern parts of the country. Several workers have recently studied the ferns of Assam, Naini Tāl, Mount Abu, Simla, Darjeeling and the Sikkim Himālayas.

The ferns show a wide range of habit, from the delicate filmy ferns (*Hymenophyllum*, *Mecodium* and *Trichomanes*) to arborescent forms (*Alsophila* and *Cyathea*) with woody trunks which sometimes attain a height of 9-12 m. or more. These tree-ferns are more common at elevations between 150 and 2,130 m. and are generally found in the shade of moist evergreen forests on mossy banks along streams.

Many ferns grow as epiphytes on trees. Among them are species of *Araiostegia*, *Arthromeris*, *Asplenium*, *Ctenopteris*, *Davallia*, *Drymoglossum*, *Drynaria*, *Lemmaphyllum*, *Lepisorus*, *Leptochilus*, *Lindsaya*, *Loxogramme*, *Mecodium*, *Microsorium*, *Nephrolepis*, *Oleandra*, *Phymatodes*, *Polypodium*, *Pyrrosia* and *Vittaria*. Of the climbing forms the most notable are *Lygodium flexuosum* Sw., *L. japonicum* Sw., *L. scandens* Sw., *Microsorium normale* Ching and *Stenochlaena palustris* Bedd.

A great many species, such as *Adiantum capillus-veneris* L., *Ampelopteris prolifera* Kze., *Cyclosorus* spp., *Diplazium* spp., *Thelypteris brunnea* Ching and *T. ciliata* Ching flourish on gravelly soil by the banks of streams. Others like *Abacopteris multilineata* Ching, *Angiopteris erecta* Hoffm., *Asplenium unilaterale* Lam. var. *rivale*, *Diplazium esculentum* Sw., *Osmunda regalis* L. and *Woodwardia radicans* Sm. grow along water courses. *Ceratopteris thalictroides* Brongn. is met with in tanks, streams and swampy ground and has marked aquatic adaptations. *Helminthostachys zeylanica* Hk. is seen in marshy places. *Acrostichum aureum* L. is characteristic of areas affected by tidal waters and along backwaters and is very common in most mangrove vegetations along the coast of Kerala.

Several ferns such as *Actiniopteris radiata* Link., *Adiantum caudatum* L., *Aleuritopteris albo-marginata* Panigrahi, *A. anceps* Panigrahi, *A. farinosa* Fee, *Blechnum orientale* L., *Cheilanthes tenuifolia* Sw., *Dryopteris crenata* Ktz., *Gleichenia glauca* Hk., *Hypodermatium crenatum* Kuhn and *Schizoloma ensifolium* J. Sm. grow on exposed rocks and show marked adaptations against drought. *Athyrium falcatum* Bedd. and *Pteridum aquilinum* Kuhn are met with in dry grassy places at higher elevations in the Western Ghāts, *Schizaea digitata* Sw. occurs in the plains and at moderately high elevations in Kerala.

There is a considerable altitudinal variation in the fern flora of India. *Actiniopteris radiata* Link., *Ampelopteris prolifera* Kze., *Ceratopteris thalictroides* Brongn., *Cheilanthes tenuifolia* Sw., *Diplazium esculentum* Sw., *Drymoglossum heterophyllum* C. Chr., *Drynaria quercifolia* J. Sm., *Henionitis arifolia* Moore, *Lygodium scandens* Sw., *Microlepia speluncae* Moore, *Nephrolepis cordifolia* Pr., *N. exaltata* Schott., *Pteris longifolia* L., *Schizoloma ensifolium* J. Sm., *Stenochlaena palustris* Bedd.. *Tectaria fuscipes* C. Chr. and *T. polymorpha* Copel. are met with up to a height of 600 m. *Abacopteris multilineata* Ching, *Ampelopteris prolifera* Kze., *Araiostegia pulchra* Copel., *Asplenium lunulatum* Sw., *Cyathea spinulosa* Wall., and *Dryopteris cochleata* C. Chr.

occur at 600-900 m., *Adiantum capillus-veneris* L., *Araiostegia pseudocystopteris* Copel., *A. pulchra* Copel., *Ceterach dalhousiae* C.Chr., *C. officinarum* DC., *Cyathea spinulosa* Wall., *Dicranopteris linearis* Und., *Lindsaya cultrata* Sw., *Oleandra musifolia* Pr., *O. neriiiformis* Cav., and *Pteridum aquilinum* Kuhn at 900-1,525 m., *Adiantum venustum* D. Don, *Alsophila latebrosa* Wall., *Cheilanthes myurensis* Wall., and *Osmunda claytoniana* L. occur at 1,525-2,135 m.; *Drynaria mollis* Bedd., *Dryopteris chrysocoma* C.Chr., *Lemmaphyllum sub-rostratum* Ching and Vittaria *himalayensis* Ching at 2,135-2,750 m.; and *Leucostegia hookeri* Bedd., *Cryptogramma brunonianana* Wall., *Dryopteris barbigera* Ktz., *D. fibrillosa* C.Chr., *D. panda* C.Chr., *D. serrato-dentata* Hay. *Gymnopteris vestita* Und. and *Pteris wallichiana* Ag. at 2,750-3,660 m. At very high altitudes, between 3,660 and 4,875 m. and above, occur *Cystopteris fragilis* Bernh., *Dryopteris serrato-dentata* Hay. *Notholaena marantae* R. Br., *Polypodium subros-tratum* C. Chr., *Polystichum prescottianum* Moore and *Woodisia lanosa* Hk. In and about glaciers and glaciated beds and on rocks covered by snow at high altitudes grow *Asplenium septentrionale* Hoffm., *Cystopteris fragilis* Bernh., *Osmunda claytoniana* L. and *Polystichum lachenense* Bedd.

The aquatic and floating ferns are represented by *Azolla pinnata* R.Br., *Salvinia cucullata* Roxb. and *S. natans* All. Some species of *Marsilea* grow in ponds and ditches and along the edges of puddles and on muddy flats. *Isoetes* is generally met with in lowlands and ponds and thrives well under submerged conditions.

**PSILOTALES** :—*Psilotum nudum* Beauv. is only species occurring in India. It may be terrestrial, epiphytic or saprophytic. It enjoys a fairly wide distribution in Kerala, the Nilgiri hills and the Godāvari District of Andhra Pradesh. It is also known from various parts of the Deccan, West Bengal, Madhya Pradesh, the Sundarbans and Assam. In the Himālayas it is found in Kumaun, extending up to Punjab and rarely to Kashmīr. It is also known from the Laccadive and Minicoy Islands, and in the Barren Island it has been reported from the interior of a crater.

**LYCOPODIALES** :—At least 34 species of *Lycopodium* grow in different parts of India. *L. hamiltonii* Spring., *L. phlegmaria* L., *L. phyllanthum* Hk. et Arn., *L. setaceum* Hamilt. and *L. squarrosum* Forst. are epiphytic while *L. cernuum* L., *L. clavatum* L., *L. serratum* Thunb. and *L. wightianum* Wall. are the common terrestrial forms. *L. alpinum* L. and *L. lucidulum* Michx. grow at higher elevations above 3,000 m. and *L. selago* L. reaches up to 4,900 m. *L. phlegmaria* L. is a pendulous epiphyte generally

growing on trees and is also found in mangrove swamps in the Sundarbans and the Andaman Islands.

**SELAGINELLALES** :—About 66 species of *Selaginella* are known from India. They are generally found in moist mountainous tracts. However, some species like *S. bryopteris* Bak. and *S. repanda* Spring occur at low elevations and under xerophytic conditions. Some of these xerophytic species curl up and turn brown on drying but remarkably revive on being moistened whence the common name “resurrection plants” for such species. The better known Indian species of the genus are *S. chrysocaulos* Spring, *S. pallidissima* Spring, *S. involvens* Spring, *S. subdiaphana* Spring, *S. pentagona* Spring, *S. monospora* Spring and *S. wightii* Hieron. Generally the species are of restricted distribution and only a few like *S. subdiaphana* Spring and *S. repanda* Spring are fairly widespread. Several species have been recorded in comparatively recent years. Most of these new records are from Assam and the NEFA.

**IOTOALES** :—*Isoetes* is typically a marsh plant occurring in shallow waterlogged depressions or along the margins of ponds and pools in the drying mud. Since the plants look very much like the sedges and grasses with which they often grow associated, it is not easy to locate them in the field. *I. coromandelina* L.f. is widely distributed both in South and North India and for a long time it was the only species of *Isoetes* known from this country. However, recently five new species have been described. They are *I. sahyadrii* Mahabale and *I. dixiti* Shende from Mahārāshtra, *I. sampatkumārani* L. N. Rao from Mysore, and *I. indica* Pant et Srivastava and *I. panchananii* Pant et Srivastava from Madhya Pradesh.

**EQUISETALES** :—Several species of *Equisetum* occur in India; *E. arvense* L., *E. debile* Roxb., *E. diffusum* Don, *E. palustre* L. and *E. ramosissimum* Desf. Of these, *E. debile* is the most common and is met with all over India. Its variety *pashan* occurs along river banks in Poona. *E. arvense* and *E. palustre* ascend up to 3,660 m. and *E. ramosissimum* up to 3,050 m. *E. ramosissimum* var. *altissimum* grows abundantly at Mussoorie and Darjeeling at an altitude of about 1,500 m.

**OPHIOGLOSSALES** :—Several species of *Ophioglossum* occur in India: *O. aitchisonii* d'Almeida, *O. costatum* R. Br., *O. gramineum* Willd., *O. japonicum* Prantl, *O. lusitanicum* L., *O. nudicaule* L., *O. pendulum* L., *O. pedunculatum* Desv., *O. reticulatum* L. and *O. vulgatum* L. The last ascends up to 2,740 m. in Eastern Himālayas. It can be found up to 2,000 m. at Mussoorie. *O. pendulum* is an epiphytic species occurring in Kerala. Most of the other species have also been collected from Kerala.

Four species of *Botrychium* occur in mountainous parts. They are *B. daucifolium* Wall., *B. lanuginosum* Wall., *B. lunaria* Sw. and *B. ternatum* Sw. *B. lunaria* is a high altitude species, occurring generally above 2,700 m. and up to 3,900 m. in Sikkim. *B. lanuginosum* reaches up to 3,000 m. in Nepāl and is also common in hill-stations like Kodaikānal and Manaar in South India. The other species are met with at comparatively lower elevations, between 1,200 m. and 2,400 m.

*Helminthostachys zeylanica* Hk. is met with in marshy areas in the Sundarbans, Upper Assam, Bengal and Kerala, and in the Western Ghāts up to an elevation of 990 m. Recently it has also been collected from Gorakhpur in Uttar Pradesh.

**MARATTIALES** :—This order is represented in India by two genera, *Angiopteris* and *Marattia*. *A. evecta* Hoffm is widely distributed at 600-1,500 m. in the Himālayas and South India, *M. fraxinea* Sm. occurs in some parts of the Western Ghāts at 1,200-1,800 m.

**FILICALES** :—The order Filicales includes the largest group of pteridophytes comprising several families. The Osmundaceae are represented by three species of *Osmunda* of which *O. regalis* L. is the most common. *O. cinnamomea* L. has been recorded from the NEFA. The Schizaeaceae are represented by *Aneimia tomentosa* Sw., four species of *Lygodium*, and two species of *Schizaea*. There are two genera of the Gleicheniaceae: *Gleichenia glauca* Hk. forms extensive thickets at high altitudes in North-East India; and *Dicranopteris linearis* Und. has a wider distribution being found even in the South. The Plagiogyriaceae is a monogeneric family with *Plagiogyria euphlebia* Mett. as the more common form. The filmy-ferns (Hymenophyllaceae) are represented by several species belonging to the genera *Cephalomanes*, *Crepidomanes*, *Didymoglossum*, *Hymenophyllum*, *Mecodium*, *Meringium*, *Pleuromanes*, *Trichomanes* and *Vandenboschia*. Nearly all are epiphytes growing in dense rain forests on moss-covered tree trunks or moist rocks. *Mecodium polyanthos* Copel. is the most widely distributed species, ranging from 900 m. to 3,600 m. The Dicksoniaceae are represented by *Cibotium barometz* J. Sm. in Eastern India. The Cyatheaceae is a family of tree-ferns represented by two genera, *Alsophila* and *Cyathea*; both are arborescent forms found in the tropical rain forests of North-east India and the Western Ghāts.

In the Polypodiaceae the more important genera are *Arthromeris*, *Cheiropleuria*, *Colysis*, *Crypsinus*, *Drynaria*, *Drymoglossum*, *Lemmaphyllum*, *Lepisorus*, *Leptochilus*, *Loxogramme*, *Microrosorium*, *Phymatodes*, *Platycerium*, *Polypodium*, *Pseudodrynaria*

and *Pyrrosia*. They are nearly always epiphytic. The Dipteridoid group is represented by the terrestrial species *Dipteris wallichii* Moore of Assam.

The family Grammitidaceae is represented by some small epiphytes, mostly restricted to Assam. *Grammitis* and *Ctenopteris* are the more common genera. In the Thelypteridaceae, *Ampelopteris prolifera* Kze is the most widespread member of the family, apart from several species of *Cyclosorus* and *Thelypteris*. *Sphaerostephanos*, *Mesochlaena*, *Stegnogramma* and *Dictyocline* are also represented.

Among the different subfamilies of the Dennstaedtiaceae, the Dennstaedtioideae is represented by *Dennstaedtia scabra* Moore and *D. appendiculata* J. Sm.-both occurring in the Himālayas. The Lindsayoideae are represented by *Lindsaya repens* Bedd. and *L. cultrata* Sw. and species of *Schizoloma* and *Sphenomeris*. The Davallioideae include several epiphytic forms and occur mainly in Eastern India. The most common genera are *Araiostegia*, *Davallia*, *Davalloides*, *Humata* and *Leucostegia*. Of the Oleandroideae there are three species of *Oleandra*—*O. wallichii* Presl., *O. musifolia* Pr. and *O. neriiformis* Cav., growing in Eastern India and 5 species of *Nephrolepis*. *Oleandra neriiformis* occurs in the Western Ghāts also. The Pteridoideae is a large subfamily with nearly 24 genera of which *Acrostichum*, *Actiniopteris*, *Microlepia*, *Pteridium*, *Pteris* and *Stenochlaena* are the most important. A dozen species of *Bolbitis* and half a dozen of *Egenolfia* represent the Lomariopsidoideae. The Elaphoglossoideae are represented by 5 species of *Elaphoglossum*.

The Parkeriaceae is a monotypic family represented by the widespread water fern *Ceratopteris thalictroides* Brongn. which is assigned by some authors to the Gymnogrammoideae.

In the Adiantaceae the Gymnogrammoideae are represented by several species of *Adiantum*, *Aleuritopteris*, *Cheilanthes*, *Hemionites*, *Onychium* and *Pityrogramma* all of which are fairly well distributed over the country. The Vittarioideae include two genera. *Vittaria* has about 8 species distributed in Eastern India and in Kerala while the small and epiphytic *Antrophyum* is comparatively rare. Of the Blechnoideae, *Blechnum*, *Doodia* and *Woodwardia* are common. In the Asplenioideae the genus *Asplenium* embraces nearly 50 species spread all over India; *Ceterach officinarum* DC. is common in the Western Himālayas. *Athyrium*, *Cystopteris* and *Diplazium* are the commonly met members of the Athyrioideae. In the Woodsioideae three species of *Woodsia*—*W. elongata* Hk., *W. alpina* Gray and *W. lanosa* Hk.—occur mostly in North-western Himālayas.

Several species of *Dryopteris* and *Polystichum* represent the sub-family Dryopteroideae. The monotypic genera *Acrophorus*, *Diacalpe*, *Lithostegia* and *Peranema* are found in the hill ranges of North-eastern India. In the Tectarioideae, *Ctenitis*, *Hypodermatium* and *Tectaria* are the most important.

**MARSILEALES:**—Some 10 species of *Marsilea* are recorded from India. *M. minuta* L. is the commonest species, widely distributed all over India. It grows in a wide range of habitat, from higher altitudes at Mussoorie to Xeric surroundings in Bikaner. *M. brachypus* A.Br. and *M. coromandelica* Burm. occur in the Madras State. *M. ballardii* Gupta and *M. aegyptiaca* Willd. are reported from Rājasthān and *M. poonensis* Kolhat. from Mahārāshtra. *M. quadrifolia* L. is widely distributed in North India.

**SALVINIALES:**—This order is represented by *Azolla pinnata* R.Br., *Salvinia cucullata* Roxb. and *S. natans* All. They occur in ponds and swampy fields in West Bengal, Chota Nāgpur, Uttar Pradesh, Assam and other parts. Both species of *Salvinia* are widely distributed in Kerala. The plants spread quickly in the backwaters, rivers and paddy fields and are a growing menace to agriculture and water transport. *S. natans* All. occurs abundantly in the Dal lake in Srinagar.

**ECONOMIC IMPORTANCE:**—The chief value of the Pteridophytes is in their ornamental nature. A few are recognized as useful medicinal plants. The leaves of *Adiantum caudatum* L. are said to be good for cough and fever, and those of *A. capillus-veneris* L. are administered with honey for catarrhal afflictions. The rhizomes of *A. lunulatum* L. are prescribed in fever and dysentery. Plants of *Actiniopteris radiata* Link., *Tectaria polymorpha* Copel. and the rhizome of *Blechnum orientale* L. are said to have anthelmintic properties. *Drynaria quercifolia* J.Sm., an epiphytic fern, is believed to be useful in typhoid fever, hectic fever and cough. The rhizomes and leaf bases of *Dryopteris chrysocoma* C.Chr. are a good substitute for *D. filix-mas* Schott. for use as a taenifuge, and species of *Lygodium*—*L. flexuosum* Sw. and *L. japonicum* Sw.—as expectorants. The roots of *L. flexuosum*, boiled with mustard oil, are good for rheumatism, sprains, eczema and cut wounds. *Osmunda regalis* L. is used as a tonic and styptic. Recently, marsiline, a sedative and anti-convulsant principle, has been isolated from the leaves and whole plants of *Marsilea minuta* L. An oil prepared from *Ophioglossum vulgatum* L. is useful for the treatment of wounds and haemorrhages. An extract from the plants of *Lycopodium clavatum* L. is used as a kidney stimulant and that from *Equisetum arvense* L. as a diuretic.

### 6. *Bryophytes*

The Bryophytes include two major groups: the Hepaticae (liverworts) and the Musci (mosses). The mosses are the more numerous and more widely distributed than the liverworts, and are especially conspicuous in colder areas where they often constitute a prominent feature of the vegetation. However, both liverworts and mosses are at their optimum in the broad-leaved, temperate forests at an altitude of 2,000-2,500 m. Places like Dalhousie, Simla, Mussoorie, Darjeeling, Shillong and Ootacamund are very rich in their bryophytic flora. As we go higher up there is a fall in the number of species.

**HEPATICAE** :—The liverworts are of two types, thallose and foliose. A large number of the thallose forms occur in moist places, some occur on exposed slopes, and a few are aquatic. *Ricciocarpus natans* Corda is an interesting floating liverwort of the Dal lake in Kashmīr and has also been collected from Naini Tāl and Kapūrthala. *Riccia fluitans* L. has been collected from the Khajiar lake (near Dalhousie), Darjeeling and from South India. The foliose or leafy forms are generally common in shady and moist places on rocks, and some grow as epiphytes. The epiphyllous forms are common in Cherrapunji and some other humid regions in Assam and in South India. Some new genera of liverworts discovered from the Western Himālayas are *Aitchisoniella*, *Sewardiella* and *Stephensonella*.

Among the alpine liverworts of the Himālayas the best known are *Blepharostoma trichophyllum* Dum., *Lophozia alpestris* Evans., *Marchantia polymorpha* L., *Plagiochasma articulatum* Kash., *Preissia quadrata* Nees, *Riccia crystallina* L., *Sauteria alpina* Nees, *S. spongiosa* Hatt. and *Scapania purpurea* Kash. some of which reach an altitude of over 4,575 m. In the temperate Himālayas occur species of *Athalamia*, *Marchantia*, *Pellia*, *Riccardia*, *Fossumbronia*, *Sewardiella*, *Madotheca*, *Lophocolea*, *Reboulia* and *Solenostoma*. The subtropical and tropical belts of the Eastern Himālayas and other mountains are rich in species of *Calypogeia*, *Jungermannia*, *Plagiochasma*, *Plagiochila*, *Preissia*, *Mastigobryum*, *Lepidozia*, *Frullania*, *Lejeunea* and *Anthoceros*.

From the Nepāl Himālayas are reported *Bryopteris trinitensis* L. et L., *Frullania wallichiana* Mitt., *Marchantia linearis* L. et L., *Plagiochasma cordatum* L. et L., *Madotheca revoluta* L. et L. and *Radula javanica* G.

Examples from Kumaun are *Anthoceros himalayensis* Kash., *Metzgeria furcata* Dum., *Notothylas levieri* Schiffn., *Plagiochasma appendiculatum* L. et L. and *P. articulatum* Kash.

Among the major forms in Assam mention may be made of *Anthoceros glandulosus* L. et L., *A. punctatus* L., *Frullania apiculata* Nees, *Plagiochasma articulatum* Kash., *Ptychanthus striatus* Nees and *Thysanthus spathulistipus* Lindb.

In the mountains of South India occur forms like *Madotheca nilgerriensis* Mont., *Dumortiera hirsuta* R. Bl. et Nees, *Frullania glomerata* L. et L., *Lunularia cruciata* Dum., *Marchantia nitida* L. et L., *Reboulia hemispherica* Raddi, *Schistochila aligera* St., *Strepsilejeunea neelgherriana* St., *Anthoceros erectus* Kash. and some 8 other species, *Mastigolejeunea repleta* St. and *Targionia hypophylla* L.

The epiphyllous liverworts of India are very imperfectly known. They occur on the leaf surface of trees mostly of wet evergreen forests of South India, Eastern Himālayas, Assam and the Andamans. About 27 species of these are so far known to occur in this country. Examples are *Leptocolea lanciloba* St., *Radula javanica* G., *Taeniolejeunea peraffinis* Zwickel, *Cololejeunea hispidissima* Herz. and *Leptolejeunea himalayensis* Pande et Misra.

Mitten's (1861) enumeration of hepaticas included at least 39 genera with 205 species from India. Stephani (1885-1924) reported about 410 species from India. Kashyap, who was for many years the leading botanist in India on liverworts, described several new genera and species and further additions were made by others. By 1952 (see Pande & Bharadwaj, 1952) the list of Indian liverworts rose to 550 species, and at present the figure is about 672. The Eastern Himālayan hepatic flora shows distinct affinities with that of the Malayan region and some members are common with China (12 species), Japan (26 species) and Australia (11 species). The Hepatic flora of Sikkim is remarkably similar to that of Yunnan and the Malayan region. South India has some species in common with Malaya and a few with China (7 species), Japan (23 species) and East Africa (17 species). The West Himālayan species show a greater affinity with Europe, and less with China (12 species) and Japan (13 species). The liverworts of the Western Ghāts have affinities with those of Africa, and of the Eastern Ghāts with those of Malaya, Java, Formosa, Sumatra and Borneo.

In the end, it must be said that many of our genera and species of liverworts are in need of critical study and monographic treatment.

**MUSCI** :—The mosses flourish in a variety of habitats. On the dry faces of cliffs of gneiss and granite occur *Anoectangium walkeri* Broth., *Anomobryum cymbifolium* Broth., *Barbula comosa* Doz. et Molk., *Brachymenium walkeri* Broth., *Campylopus gracilis* Jaeg., *Hyophila cylindrica* Jaeg. and *Weisia edentula* Mitt. On pegmatite, lime and black loam occur *Barbula indica* Brid., *Hyophila involuta* Jaeg. and *Rhodobryum giganteum* Par. A number of mosses, such as *Brachythecium procumbens* Jaeg., *Bryum wightii* Mitt., *Dicranella heteromalla* Schimp., *Fissidens lutescens* Broth., *Garckea phascoides* C. Müll. and *Trematodon ceylonensis* C. Müll., grow on the banks of streams and on clay in shady places. On comparatively dry banks we meet *Bryum ramosum* Mitt., *Campylopodium khasianum* Par., *Dicranella pomiformis* Jaeg. and *Funaria hygrometrica* Dill. var. *calvascens*.

*Bryum apalodictyoides* C. Müll., *Fissidens anomalus* Mont., *Leucobryum wightii* Mitt., *Leucoloma walkeri* Broth., *Tayloria schmidii* C. Müll. and *Trichosteleum monostictum* Broth. grow on dead and decayed tree trunks. On trees in dry open jungles we find *Brachymenium nepalense* Hk., *Leucobryum hamillimum* Cardot, *Macromitrium leptocarpum* Broth., *Trachypus blandus* Mitt. and *T. crispatulus* Mitt. In very dense jungles, several mosses grow as felts on large trees and their branches and may loosely hang down like festoons. As examples may be mentioned *Aerobryum speciosum* Doz. et Molk., *Leucoloma renauldii* Broth., *Macromitrium moorcroftii* Schw., *M. sulcatum* Brid. and *Trichostomum hyalinoblastum* Broth. Some mosses form mats on tree trunks. *Brachymenium weisia* Hk., *Campylopus goughii* Jaeg., *Meteoriump reclinatum* Mitt., and *Thamnium alopecurum* Bry. are examples of such mosses. A few species occur on plantation crops—*Papillaria fuscescens* Jaeg. on orange trees; and *Acrocryphaea concavifolia* Bry. and *Meteoriump brevirameum* Broth. on coffee bushes. Species of *Sphagnum* are characteristic of bogs. *Fissidens grandifrons* Brid. grows on rocks directly under waterfalls.

Several species are known from the mountains. Of those growing between 1,200 m. and 1,800 m. the most important are *Bryum argenteum* L., *Mnium lycopodioides* Hk., *Philonotis falcatula* Mitt. and *Tortula inermis* Mont. Between 1,800 m. and 2,700 m. grow *Bryum turbinatum* Hedw., *Desmatodon latifolium* Brid., *Funaria hygrometrica* Dill., *Grimmia leucophaea* Grew., *Plagiopus oederi* Limpr. and *Mnium medium* Br. et Sch. Among

important species occurring between 2,700 m. and 3,300 m. are *Amphidium lapponicum* Schimp., *Barbula recurvifolia* Mitt., *Grimmia commutata* Hubn., *Trichosteleum brachypelma* Broth. and *Orthotrichum anomalum* Hedw. The high altitude (3,000 m.) mosses from Nepāl Himalayas include *Bryum ventricosum* Dicks., *Dicranum himalayanum* Mitt., *Pleurozium schreberi* Mitt., and *Trachypodopsis crispatula* Fleisch. *Rhytidium rugosum* Kindb., grows at an altitude of 4,600 m. and species of *Andreaea* are seen at about 4,900 m.

Several species occurring in India are also met with in other parts of the world. Among others *Distichium inclinatum* Br. et Sch., *Fissidens grandifrons* Brid., *Grimmia ovata* Web. et Mohr., *Mnium lycopodioides* Hk. and *Weisia wimmeriana* Bry. occur in Europe. Species in common with North America are *Barbula vinealis* Brid., *Dicranum undulatum* Enrh., *Ditrichum tortile* Lindb., *Sphagnum teres* Angs. and *Timmiella anomala* Limpr. *Campylopus comosus* Bry., *Dicranella heteromalla* Schimp. and *Herpetineurum toccae* Card. are common with South America. The species in common with Africa are *Anoectangium euchloron* Mitt., *Ditrichum flexifolium* Hamp., *Grimmia commutata* Hube. and *Trichostomum cylindricum* C.Müll. and with Madagascar there are *Floribundaria floribunda* Fleisch. and *Philonotis laxissima* Mitt. The mosses in common with Australia and New Zealand are *Bartramia pomiformis* Hedw. and *Gymnostomum calcareum* Hornsch.

The following species occur in India as well as Indonesia, Malaysia part of Borneo and the Philippines : *Dicranella setifera* Jaeg., *Fissidens splachnobryoides* Broth., *Leucobryum aduncum* Doz. et Molk., *Leucobryum javense* Mitt., *Microdus brasiliensis* Ther., *Philonotis falcata* Mitt., *P. fontana* Brid. and *Rhodobryum giganteum* Par. Species in common with China are *Cleistostoma ambigua* Mitt., *Dicranum perfalcatum* Broth., *Fissidens nobilis* Griff., *Macromitrium nepalense* Schw., *M. sulcatum* Brid., *Orthotrichum hookeri* Mitt., *Papillaria fuscescens* Jaeg., *Ptychomitrium tortula* Mitt., *Rhacopilum schmidii* C. Müll., *Sphagnum junghuhianum* Doz. et Molk., *Tortella fragilis* Limpr. and *Trachypodopsis crispatula* Fleisch. In common with Japan we have *Anisothecium rufescens* Lindb., *Brothera leana* C. Müll., *Leucobryum nilghiriense* C. Müll., *Leucoloma nitens* Par., *Sphagnum acutifolium* Enrh. and *Thysanomitrium blumei* Broth.

Out of 17 species of *Sphagnum* occurring in India, 7 are indigenous. The latter are as follows—*Sphagnum acutifoloides* Warns., *S. contortum* Wils., *S. cuspidatum* Enrh., *S. griffithianum* Warns., *S. khasianum* Mitt., *S. obtusifolium* Griff. and *S. ovatum*

*Hampe* var. *cymbifolium*. *Bryum*, *Campylopus* and *Fissidens* are large genera, each with over 50 species. The Archidiaceae is a monogeneric family with the genus *Archidium* having 3 species in Kanara and the Palni hills. Similarly, the Encalyptaceae has only the genus *Encalypta* having 5 species in Punjab, Kashmīr, North-western Himālayas and Ladākh.

Some new genera and species of mosses have been described from India. Among the former are *Dendrocyathophorum* and *Ortholobium*. Of the several new species discovered in this country mention may be made of the following few: *Barbula dharwarensis* Dix., *Ctenidium stereodontooides* Dix., *Dicranum orthophylloides* Dix., *Duthiella mussooriensis* Reimers., *Fissidens karwarensis* Dix., *Macromitrium nilgirense* C. Müll., *Physcomitrellopsis indica* Dix. and *Splachnobryum indicum* C. Müll. It must be noted that, so far, mosses have been collected and described only from certain restricted areas of this country. Extensive and systematic collections from all over the country and preparation of keys and checklists for easy identification of our common local mosses is long overdue.

### 7. *Algae*

The algae constitute a large group of plants in which the plant body generally exhibits little or no differentiation of the vegetative organs into true stems, roots and leaves. They vary from simple unicellular forms, like *Euglena*, *Chlamydomonas*, *Protosiphon*, *Botrydium*, and the desmids and diatoms, to more complex multicellular forms. Many of the simpler forms are faultlessly symmetrical and are among the most beautiful objects in the world. In the largest forms the plant body may be differentiated into a blade, stipe (sometimes extremely long) and a specialized holdfast sometimes also accompanied by considerable internal differentiation. Particularly interesting are species of *Sargassum* for here the plant body is divisible into structures resembling leaves, stems, and branches. There are also bladders which look like tiny berries so that superficially the plants have the appearance of an aquatic angiosperm.

Algae occur in a variety of climatic and edaphic conditions in tropical, temperate, arctic, antarctic and alpine zones. They also occur in fresh water, brackish water, in marine situation, and on damp earth, walls, bricks, tree trunks, barks and leaves. Some

forms are lithophytic, epiphytic, endophytic, symbiotic, parasitic or endozoic.

Some algae also occur at high altitudes. Among them are species of *Zygnema*, *Oedogonium* and *Vaucheria* together with some desmids and diatoms. *Hydrurus* and *Batrachospermum* occur as lithophytes up to 2,500 m. At slightly lower elevations we have *Oocystis solitaria* Wittr., *Staurastrum cuspidatum* Breb. and a few species of *Cosmarium* and *Closterium*. Marine planktonic forms like *Hornellia marina* Subrahmanyam, *Trichodesmium erythraeum* Ehrenb. and some Dinophyceae are responsible for the yellow-green or green "discoloration", or "red tides", and phosphorescence of the sea.

Algae are classified into several phyla of which the more important are: Cyanophyta (blue-green algae), Chlorophyta (green algae), Charophyta (stoneworts), Euglenophyta (euglenoids), Pyrrophyta (cryptomonads and dinoflagellates), Chrysophyta (yellow-green, golden-green algae and diatoms), Phaeophyta (brown algae), and Rhodophyta (red algae).

**CYANOPHYTA:**—Members of the Cyanophyta are found in a great variety of situations exhibiting extremes of environmental and ecological conditions. In India there are more than 85 genera and 750 species belonging to 18 families. Of these the largest number of genera (15) fall under the Oscillatoriaceae. There is a new family Mastigocladiopsidaceae of Indian origin with seven genera—*Camptylonemopsis*, *Iyengariella*, *Mastigocladopsis*, *Par-sarthella*, *Spirulinopsis*, *Thackerella* and *Westiellopsis*.

Some interesting forms are known to inhabit the shells of molluscs, gastropods and barnacles. Some occur in dead corals. Some salt tolerant Myxophyceae of the genera *Anabaena*, *Anabaenopsis*, *Arthrosira*, *Myxosarcina* and *Synchococcus* form dense planktonic populations in the Sāmbhar lake in Rājasthān.

A few species of the Myxophyceae are known from hot springs at temperatures ranging from 30°C to 54°C. The more important among them are species of *Anabaena*, *Aphanocapsa*, *Aulosira*, *Gloeocapsa*, *Oscillatoria*, *Phormidium*, *Plectonema* and *Scytonema*. Many of the blue-green algae occur in the soil. Among these the following are known to be nitrogenfixers: *Anabaena ambigua* Rao, *A. fertilissima* Rao, *Aulosira fertilissima* Ghosh, *Cylindrospermum sphaerica* Prasad, *Nostoc paludosum* Kutz. and *Tolypothrix tenuis* Jhos. Species of *Nostoc* and *Anabaena* live symbiotically in association with other plants such as *Anthoceros*, *Azolla* and *Cycas*. Some of the blue-green algae living in soil have been considered useful in reclaiming "ūsar" lands in Uttar Pradesh.

Several forms occur as plankton, sometimes in such abundance as to colour the entire body of water and form a fairly thick layer. The chief components of these waterblooms, mostly found only in alkaline waters, are *Microcystis*, *Arthrospira*, *Spirulina*, *Anabaena*, *Oscillatoria* and *Trichodesmium*. When in great abundance, they not only harm fishes and animals but also offer serious problems in drinking water supplies by choking the sand filters.

**CHLOROPHYTA:**—Significant contributions have been made by Indian algologists on the green algae of paddy fields, hot springs, fresh and marine waters, and desiccated areas. Among new genera special mention may be made of *Characiosiphon*, *Chloranomala*, *Cylindrocapsopsis*, *Dendrocystis*, *Ecballocystopsis*, *Fritschella*, *Gloeotilopsis*, *Heterotrichopsis*, *Hormidiella*, *Oocystaenium*, *Sirocladium*, and *Willella*. Many botanists consider that land plants must have evolved from algae through a form like *Fritschella*. *Characiosiphon* is also unique.

The Zyglenataceae and Desmidiaceae are large groups with a wide distribution. Among the latter, a new genus *Triplastrum* has been described from South India.

Species of *Chlamydomonas* and *Dunaliella* constitute major blooms in the Sāmbhar lake in brine of 17° to 26° Baumé, and *Dunaliella salina* Teod. grows in salt pans on the coast of Saurāshtra in water having a salt concentration of 26° to 30° Baumé.

On an approximate estimate, at least 34 genera are marine: 9 are from the east coast and 28 genera from the west coast. The more well known of these are: *Acetabularia*, *Anadyomene*, *Avrainvillea*, *Boergesenia*, *Boedea*, *Bryopsis*, *Caulerpa*, *Chaetomorpha*, *Chamaedoris*, *Cladophora*, *Codium*, *Dictyosphaeria*, *Enteromorpha*, *Halicystis*, *Halimeda*, *Microdictyon*, *Neomeris*, *Struvea*, *Trichosolen*, *Tydemania*, *Udotea*, *Ulva*, *Valonia*, and *Valoniopsis*. The total number of species is about 100. In inland fresh waters many of the Chlorophyta (especially desmids, Volvocales and Chlorococcales) form important constituents of the phytoplankton.

**CHAROPHYTA:**—The members of this group form extensive underwater meadows in ponds and rivers and have structures which bear a superficial resemblance to roots, stems and leaves. Until 1822 only two genera of the Charophyta were known from India : *Chara* and *Nitella*. *Nitellopsis*, *Lychnothamnus* and *Tolypella* were reported later. Thus the group is now represented in India by *Chara* (26 species), *Nitella* (34 species), *Lychnothamnus* (1 species), *Nitellopsis* (1 species), and *Tolypella* (3 species). Sixteen species of *Chara* and one of *Nitellites* are represented in the Deccan Intertrappean fossil beds.

**CHRYSTOPHYTA:**—The genus *Vaucheria* is represented by 11 species. Of these *V. hamata* Walz. is very common on the soil in the spring season. *V. terrestris* Lyngbye em Walz. occurs in Kashmīr in the Amarnāth cave at 3,885 m. and *V. sessilis* (Vanch.) Dc. in the cave-like vaults on the sides of the Verināg spring. *Botrydium* is characteristic of drying mud and is represented by *B. granulatum* Grev., *B. tuberosum* Iyn. and *B. divisum* Iyn. *Hydrurus*, *Synura*, *Dinobryon*, *Mallomonas* and *Chrysodictyon* are the chief members of the Chrysophyceae. Of these *Hydrurus* is found only in the cool waters of mountain streams as in Kashmīr.

The diatom flora of inland as well as marine waters has been studied by several botanists. A large number of new species have been recorded for which reference must be made to other sources.

**EUGLENOPHYTA:**—The Euglenophytes are all inhabitants of foul water. There are 11 freshwater genera and 1 marine genus *Protoeuglena*. An interesting report is that of *Cladospongia* which is a colourless form belonging to the order Protomastigineane. One or two species of *Euglena* are frequently responsible for the red scums of stagnant inland waters.

**PHAEOPHYTA:**—Apart from *Sargassum*, there are at least 30 other genera with 75 species. All of these are marine and include *Chnoospora*, *Cladostephus*, *Colpomenia*, *Cystophyllum*, *Dictyota*, *Dictyopteris*, *Ectocarpus*, *Hecatonema*, *Hormophysa*, *Hydroclathrus*, *Mesogloea*, *Myriogloea*, *Nemacystus*, *Padina*, *Spathoglossum*, *Sphaelaria*, *Streblonema*, *Turbinaria* and *Zonaria*. *Iyengaria* is a new genus with the species *I. stellata* Boerg.

**RHODOPHYTA:**—No less than 125 genera with about 300 species occur in India. The chief of these are *Acanthophora*, *Agardhiella*, *Amphiroa*, *Antithamnion*, *Asparagopsis*, *Batrachospermum*, *Botryocladia*, *Caloglossa*, *Ceramium*, *Champia*, *Chondria*, *Chrysymenia*, *Claudea*, *Coelarthurum*, *Corallina*, *Dasya*, *Dictyurus*, *Enantiocladia*, *Galaxaura*, *Gastroclonium*, *Gelidiella*, *Gelidium*, *Gigartina*, *Gracilaria*, *Grateloupa*, *Gymnothamnion*, *Halymenia*, *Helminthocladia*, *Heterosiphonia*, *Hypnea*, *Hypoglossum*, *Laurencia*, *Lemanea*, *Liagora*, *Neurymenia*, *Nitophyllum*, *Polysiphonia*, *Porphyra*, *Rhodymenia*, *Sarcodia*, *Sarcomenia*, *Sarcocoma*, *Scinaia*, *Spyridia*, *Thorea* and *Vanvoorstia*. A new family *Corynomorphaceae* has been created for the genus *Corynomorpha*.

While most of the red algae are marine, a few freshwater representatives are also known. Among the latter are *Acrochaetium*, *Batrachospermum*, *Compsopogon*, *Sirodotia* and *Thorea*. *Compsopogon* is represented by three species, *C. coeruleus* Mont., *C. hookeri* Mont. and *C. iyengarii* Krish.

*Ecology and Distribution of the Marine Forms*

There are several places, both on the Peninsular coast and in the nearby islands and archipelagos, which show a rich algal vegetation. Among these are : Dwārka, Mul Dwārka and Okha in the Kutch-Saurāshtra area; Bombay, Mālvan and Kārwār further down the Western Coast; Kanniyākumāri at the southernmost extremity; Rāmeswaram, Pāmban, Kursadi, Shingla and neighbouring islands, Tuticorin, Hare Island and Church Island, all in the southern part of the eastern coast; and Mahābalipuram, Madras and Waltair further up on the eastern coast. In addition, the Laccadives, the Andamans and the Nicobars also provide rich algal collections.

In the various islands in the Gulf of Manaar and in the Laccadives, the substratum is mostly coralline conglomerate or sandstone. In the Andamans and Nicobars coralline and other rocky substrata are met with. In the other localities, particularly on the Peninsular coast, rocks of laterite, sandstone, altered traps, gneiss or schists serve as substrata. Certain localities like Long Island and Port Blair in the Andamans, Kursadi, Hare Island, Shingle Island and Church Island on the eastern peninsular coast, and Okha-Dwārka on the western coast are particularly favourable for algal collections as a large stretch of the coast is uncovered at low tide.

In all areas favourable for luxuriant algal growth, species belonging to the Chlorophyta, Phaeophyta and Rhodophyta are well represented. Although it is often difficult to demarcate clearcut zones due to the complexity of the associations, it is nevertheless possible in most areas to divide the algal vegetation into some broad belts, viz., the infra-littoral belt, extending from low watermark to deeper waters; the littoral belt, extending between high and low water marks and which may often show three clear zones (the lower littoral, the mid-littoral and the upper littoral); and the supra-littoral belt lying above high watermark.

Of the red algae, *Chrysymenia uvaria* J.Ag., *Halymenia dilatata* Zan., *Dictyurus purpurascens* Bory, *Neurymenia fraxinifolia* J.Ag., *Scinaia carnosa* Harv. are some of the typical forms met with in the infra-littoral region. Others like *Halymenia venusta* Boergs., *Asparagopsis taxiformis* Coll. et Herv. and *Botryocladia leptopoda* Kylin, though characteristic of the infra-littoral belt, are sometimes found further up in the littoral region. The lower littoral zone is populated mostly by species of *Gelidium*, *Polysiphonia*, *Ceramium*, *Laurencia* and *Gracilaria*, while the mid-

littoral and upper littoral regions show more of brown and green algal communities and comparatively fewer red algae. *Colpomenia sinuosa* Derb. et Sol., *Iyengaria stellata* Boergs. and *Hydroclathrus clathratus* Howe and species of *Padina*, *Sargassum* and *Dictyota* are some of the typical brown algae of this region. The green algae are represented by *Codium*, *Caulerpa*, *Ulva*, *Enteromorpha*, *Chaetomorpha*, and *Cladophora*. Within the tidal limits, there are rock pools of different sizes and depths which harbour interesting algal associations. In the very deep rock pools are seen red algae like *Botryocladia leptopoda* Kylin and *Galaxaura oblongata* Lamx. intermingled with brown and green algae. In pools higher up we see the red algae-like species of *Amphiroa*, *Jania*, and *Gracilaria* along with *Champia parvula* Harv., *Heterosiphonia muelleri* De Toni, and *Liagora ceranoides* Lamour.; species of *Padina*, *Sargassum* and *Dictyota* and other brown algae; and green algae like *Acetabularia mobii* Solms-Labauch, *Chamaedoris auriculata* Boergs. and species of *Enteromorpha*, *Ulva*, *Caulerpa*, and *Chaetomorpha*. In the supra-littoral region the rocks, exposed to heavy swell and surf, harbour a characteristic flora comprising species of *Chaetomorpha*, *Cladophora* and *Halimeda* of the green algae; *Ectocarpus*, *Myriogloea*, *Namacystus*, and *Chnoospora*, of the brown algae; *Porphyra*, *Liagora*, *Sarcodia*, *Gratelouphia*, *Gracilaria* of the red algae; and blue-green algae like species of *Lyngbya*, *Microcoleus* and *Calothrix*. *Boergesenia*, *Udotea* and at places *Avrainvillea* are found on reefs and coralline substrata heavily silted with fine sand and mud to form flats which frequently get exposed at low tide. In such situations *Acetabularia* and *Neomeris* are also found at times growing on fragments of dead corals. In shallow lagoons, several brown algae like *Cystophylllum muricatum* J.Ag., *Dictyopteris delicatula* Lamour., *Hormophysa triquetra* Kutz, *Spathoglossum asperum* J.Ag., *Stoechospermum marginale* Kutz, and species of *Turbinaria*, *Sargassum* and *Padina* occur associated with red algae like *Dictyurus*, *Acanthophora*, *Gracilaria* and *Hypnea*.

The brackish water mangrove swamps and salt marshes which occur scattered all along the coast also show very characteristic algal communities in which all the major groups are represented.

From the available information on the marine algal flora of Indian coasts it appears that there is considerable affinity with the flora of Mauritius (35.8% of the species are common to both floras) and the Atlantic coasts of the USA and Europe (22.7% of the species are common to both floras). About 22.5% of the species are common to Indonesia and India, and 22% to the West Indies and India. In the Pacific zone, Australia claims more

species in common with India (20·3%) than Japan (20·1%). Thus, the Indian coast harbours a complex variety of algal vegetation, comprising many species which have extensive distribution both in tropical and temperate seas, and a few even extending to the Arctic seas. In comparison with the Peninsular flora, those of the Laccadives and Andamans have a number of species peculiar to each and not in common with the Indian coastal flora although some of these species have a very wide geographical distribution.

**ECONOMIC IMPORTANCE :**—Several marine forms and a few freshwater ones are edible. Special mention may be made of *Caulerpa*, *Enteromorpha*, *Gracilaria*, *Hydroclathrus* and *Ulva*. *Ulva fasciata* Delile is found in quantity on the Gujarāt coast and has a protein content of dry seaweed of 31%. There is, therefore, the possibility of cultivating this species for food purpose in sea water.

Among the genera that can be used as sources of agar the most important are *Gelidium*, *Gracilaria*, *Hypnea* and *Sarconema*. The Indian agar potential is estimated at 13 metric tonnes annual, with an average yield of 28% on dry seaweed of the different species of agarophytes, while the Indian consumption is about 30 metric tonnes annually.

### 8. *Fungi*

The systematic study of fungi in India began only in the last quarter of the 19th century. Until about 1875 all collections of Indian fungi were being sent for study and identification to Europe, and for many years M. J. Berkeley was the chief determiner of Indian fungi. From 1875 onward such work began to be undertaken in India itself. D.D. Cunningham and A. Barclay were the pioneers in this field, and their studies on the Mucorales, the Ustilaginales and the Himalayan rusts are still looked upon with high regard. K. R. Kirtikar studied the agarics and the Gasteromycetes. The arrival of E. J. Butler in India at the turn of the present century gave a special impetus to the subject. Before his return to the U.K. in 1920, his all time classic—*Fungi and Disease in Plants*—had already been published. He also laid the foundation of the *Herbarium Cryptogamiae Indiae Orientalis*, which is now our national herbarium for fungi and is located in the Indian Agricultural Research Institute in New Delhi. During the last 40 years Indian mycologists have taken an increasing share in a taxonomic study of fungi and among them special mention may be

made of the following; J. F. Dastur, J. H. Mitter, B. B. Mundkur, C. V. Subramanian, and M. J. Thirumalachar. The year 1931 saw the publication of the first all India list of fungi—*The Fungi of India*—by E. J. Butler and G. R. Bisby. Recently it has gone through a new edition and is now a valuable work of reference.

Due to the diversity of the Indian climate we have many representatives of the fungal flora of Europe as well as of the Tropics. However, in comparison with the phanerogams, the fungi are still only partially explored and the total number so far known is just about five thousand.

The Myxomycetes or slime fungi have received a fair amount of attention in recent times and over 205 species are now recorded. The commonest genera are *Arcyria*, *Badhamia*, *Ceratiomyxa*, *Comatricha*, *Craterium*, *Cibraria*, *Diachea*, *Dictyidium*, *Diderma*, *Didymium*, *Fuligo*, *Hemitrichia*, *Lamproderma*, *Lycogala*, *Perichaena*, *Physarella*, *Physarum*, *Reticularia*, *Stemonitis* and *Trichia*.

Of the Phycomycetes there are 324 species included under 64 genera. Among the lower Phycomycetes the genus *Synchytrium* is represented by more than 58 species and the genus *Physoderma* by 18 species. The Blastocladiales have 4 species under *Allomyces* and 4 under *Blastocladia*. Among the Peronosporales, the chief genera—*Albugo*, *Bremia*, *Peronospora*, *Phytophthora*, *Plasmopara*, *Pythium* and *Sclerospora*—are each represented by several species. Fifteen genera of the Mucorales are known of which the commonest are *Absidia*, *Choanephora*, *Cunninghamella*, *Mucor*, *Pilobolus*, *Rhizopus* and *Syncephalis*. There are two genera representing the Entomophthorales: *Conidiobolus* and *Entomophthora*.

The Hemiascomycetes are represented by *Eremascus*, *Hansenula*, *Nematospora*, *Saccharomyces*, *Taphrina*, *Protomyces* and *Protomycopsis*. Most of the apothecial fungi are represented by a single species except genera like *Ascobolus*, *Dasyscypha*, *Humaria*, *Morchella*, *Peziza* and *Pseudopeziza*. *Morchella esculenta* Pers. grows in Kashmir, parts of Punjab and Naini Tāl and is eaten in North India as a delicacy. The Sphaeriales are represented by a large number of genera of which *Chaetomium*, *Glomerella*, *Mycosphaerella*, *Physalospora*, *Rosellinia* and *Xylaria* are the most common. *Phyllachora* has as many as 62 species. *Claviceps purpurea* Tul., the ergot fungus, is cultivated on rye in the Nilgiris and Darjeeling. Most of the genera of the Erysiphaceae are present, although their perfect stages are not always seen except in the cooler areas of North India. There are no less than 58 species of *Meliola*.

The Ustilaginales and the Uredinales are very well represented. *Ustilago* has 56 species; *Sphacelotheca* has 53; and *Urocystis*, *Tilletia*, *Entyloma* and *Sorosporium* have also several species each. *Puccinia* is represented by 234 species, *Uromyces* by 83, *Ravenelia* by 28, *Melampsora* by 14, *Phakopsora* by 15 and *Hemileia* by 11 species. Among the important genera of the Agaricales may be mentioned *Agaricus*, *Armillaria*, *Boletus*, *Collybia*, *Daedalea*, *Fomes*, *Ganoderma*, *Hydnus*, *Lentinus*, *Lenzites*, *Lepiota*, *Polyporus*, *Polystictus* and *Poria* whereas *Lycoperdon*, *Podaxis*, *Sclerotoderma* and *Tylostoma* represent the Gasteromycetes. Many of the agarics are edible and are widely distributed in India. *Cantharellus cibarius* Fr. is particularly common in the hills of the northern and eastern parts. It grows during the rainy season and is regarded as a delicacy. Another edible mushroom, *Volvaria diplasia* Sacc., occurs in Bengal and Madras. *Phellorinia inquinans* Berk. and *Calvatia gigantea* Fr. (Gasteromycetes) are found in the plains of North India. The latter looks like a pumpkin and is eaten only in the young stage when the inner portion is still white.

Among the Deuteromycetes the Moniliales have the largest number of species. *Cercospora* has 270 species while *Helminthosporium*, *Fusarium* and *Alternaria* are also large genera. Common representatives of the other orders are *Ascochyta*, *Colletotrichum*, *Diplodia*, *Macrophoma*, *Pestalotiopsis*, *Phoma*, *Phyllosticta* and *Septoria*.

During recent years several new genera have been discovered from different parts of the country. Among these are *Saksenaea* (Mucorales), *Bagcheea* (Sphaeriales), *Mundkurella*, *Zundelula*, *Narasimhania* (Ustilaginales), *Dasturella*, *Ceropsora*, *Kernella*, *Didymopsorella* (Uredinales), *Alpakesa*, *Bahu sandhika*, *Dwayabeeja*, *Pseudotorula* and *Anthasthoopa* (Deuteromycetes).

### *Plant Diseases caused by Fungi*

Of the fungal diseases the most important is the wheat rust which is estimated to cause an annual loss of about 500 lakh rupees. The Bengal famine of 1942 has been partly attributed to the helminthosporium disease of rice, while the red rot of sugar-cane has been responsible for several epidemics from time to time.

The club root of crucifers, caused by *Plasmodiophora brassicae* Wor., is common in the hills of South India. The "damping

off" of tobacco, tomato, and crucifers, caused by *Pythium debaryanum* Hesse and *P. aphanidermatum* Fitzp., is widespread. These two fungi also cause the fruit rot of cucurbits, foot rot of papaya and soft rot of ginger. The late blight of potato, caused by *Phytophthora infestans* de Bary, occurs regularly in the hills and occasionally in the plains when the weather conditions are moderate. *P. palmivora* Butler causing the bud rot of palms causes much damage on the east coast of South India. It is also responsible for the fruit rot and nut fall (Koleroga) of areca in Western Peninsular India and Assam. *Peronospora* causing the downy mildew of several winter crops and *Albugo* causing the white rust of crucifers are common but the diseases are not serious. *Sclerospora graminicola* Schröt., is responsible for the green ear disease of *bājra* which is quite damaging at times.

The stem gall of coriander (*Protomyces macrosporus* Ung.) is widespread and sometimes affects seed setting in this crop. *Taphrina deformans* Tul. causes the leaf curl of peaches in Kashmīr, Kulu, Kumaun, Simla, Nilgiri and Palni hills. *T. maculans*, Butler, causing the leaf-spot of turmeric, is very troublesome in Gujarat, the Northern Circārs, Orissa and Andhra Pradesh. *Aspergillus niger* Van Tiegh. causes a soft rot of apples in Uttar Pradesh and seedling blight of ground-nut in North India. *Erysiphe polygoni* DC. is a common mildew affecting the pea, lentil, and other leguminous crops. *E. graminis* DC., the powdery mildew of cereals, does much harm to wheat and barley in the hills and submontane districts. The powdery mildew of vines is also common but not in an epidemic form. *Glomerella tucumanensis* Arx et Müll. causes the red rot of sugar-cane which is very serious in North and East India. Gram blight, caused by *Mycosphaerella rabiei* Kov. is damaging in North India. *Helminthosporium oryzae* Breda de Haan is widespread on rice in Assam, Bengal and parts of Madras.

There are smuts affecting all the important graminaceous crops. *Ustilago tritici* Jens. causing the loose smut of wheat, is common in most tracts. *Tilletia indica* Mitra (Karnal bunt) causes a partial bunt of wheat in the submontane regions of Punjab and Uttar Pradesh. The flag smut of wheat occurs in the Punjab and the root smut gall of mustard is found in Bihār. Both the diseases are caused by *Urocystis*. All the three rusts of wheat are widespread but the alternate hosts do not play any role in their perpetuation. The rusts of linseed, coffee and gram are common. The conifers are also subject to a number of rusts. *Cronartium himalayense* Baghee is endemic and parasitises *Pinus roxburghii* Sarg. The blister blight of tea (causal organism—*Exobasidium vexans* Massee) is prevalent in a serious form in Darjeeling and Madras.

*Pellicularia salmonicolor* Dast. causes the pink disease of orange in Madhya Pradesh. It is widespread among other plantation crops such as tea, rubber, coffee, cinchona and mango. *Ganoderma lucidum* Karst., causing spongy rot, has been recorded from various parts of India on *Casuarina equisetifolia* Forst., *Areca catechu* L., *Pongamia pinnata* Pierre, *Guazuma tomentosa* H.B.K., *Acacia* spp., *Pterocarpus marsupium* Roxb., *Cocos nucifera* L. and several others. *Trametes pini* Lloyd causes the red ring rot of many Himalayan conifers. Other wood rotting fungi of India are *Armillaria mellea* Quel., *Fomes badius* Berk., *F. senex* Nees et Mont., *Polyporus gilvus* Schwein. and *P. palustris* Berk. et Curt.

Among the Deuteromycetes the most important fungal pathogens are *Fusarium* and *Piricularia*. *P. oryzae* Cavara causes the blast of paddy which is especially destructive in Madras, the losses being 30-35% in certain localities. *Fusarium udum* Butler causing the wilt of pigeon peas, does much harm in parts of Mahārāshtra, Madhya Pradesh, Uttar Pradesh and Bihār. *F. vasinfectum* Atkins. is prevalent in the black cotton soil area of the Deccan and Gujarāt. The stem rot of jute caused by *Macromphomina phaseoli* Ashby is a limiting factor in the successful cultivation of this valuable crop.

Till 1931, only 2,351 species of fungi were known with 75 species under the Phycomycetes, 476 under the Ascomycetes, 1,339 under the Basidiomycetes, and 461 under the Fungi Imperfeci. By 1938 this number increased to 2,868, and in 1951 to 3,680. During the last 11 years, 64 new genera and 1,150 new species have been recorded—a good indication of the activity of mycologists and plant pathologists throughout the country.

### 9. *Lichens*

Although lichens occur in abundance in the mountains of India, their study has so far received only scant attention. C. Montagne, C. Babington, W. Nylander, J. Müller Argoviensis, J. Stirton, A. Jatta, R. Paulson and A. L. Smith made the initial contributions to the lichen flora of India. G. L. Chopra (1934) gave a comprehensive and illustrated account of 75 lichens collected from Darjeeling and the Sikkim Himalayas. Presently, D. D. Awasthi at Lucknow has taken much interest in a study of the Indian lichens.

The chief interest of lichens lies in their comprising two distinct symbiotic partners, a fungus and an alga. The algal cells are enveloped in the intricate felted mass of fungal hyphae, and the two members mutually benefit by this association. The fungal element generally belongs to the Ascomycetes (only three genera are basidiomycetous and of these only one is known from India), the algal partner being a member of the Myxophyceae or the Chlorophyceae. The lichens form incrustations (crustose forms), foliaceous masses (foliose forms), or branching forms (fruticose forms) on rocks, soil, tree-trunks, leaves and other suitable substrata.

Over 800 species are known from the Indian subcontinent (including Nepāl) and the Andamans. Of these the following families are represented by a large number of species: Usneaceae (78 spp.), Parmeliaceae (74 spp.), Graphidaceae (71 spp.), Lecanoraceae (62 spp.), Physciaceae (61 spp.), Lecideaceae (60 spp.), Cladoniaceae (53 spp.), and Pyrenulaceae (45 spp.). The other families which have a smaller number of species are Collemaceae (28 spp.), Stictaceae (18 spp.), and Peltigeraceae (15 spp.) while families like the Dermatocarpaceae, Caliciaceae, Sphaerophoraceae, Diploschistaceae, and Teloschistaceae are represented by less than 5 species each.

The crustose lichens occur abundantly in India in deciduous and mangrove forests and alpine regions on tree and rocky surfaces. Only the temperate regions are really favourable for the best growth of lichens, and some species reach up to an altitude of 5,000 m. A few also inhabit snow and glacial beds, growing as lithophilous forms on rocks and can withstand a burial under the snow for the greater part of the year. *Dermatocarpon miniatum* Th.-Fr. grows on exposed rocks, and *Caloplaca murorum* Th.-Fr. on volcanic rocks. *Endocarpon pusillum* Hedw., *Peltigera malacea* Ach. and *Cladonia rangiformis* Hoffm. grow on hard and dry soil. *Rinodina sophodes* Th.-Fr. occurs in salt marshes and *Cetraria ambigua* Bab. on hard soil in alpine belts. A good number of species such as *Lobaria pulmonaria* Hoffm., *Peltigera polydactyla* Hoff. and *Sticta fuliginosa* Ach. grow on the barks of various trees along with mosses. Altitudinally, *Coccocarpia pellita* Müll.-Arg. and *Sticta weigeli* Wain. are the common forms between 1,220 m. and 1,525 m.; *Leptogium saturninum* Nyl. at 1,830 m.; *L. menziesii* Mont., *Lobaria pulmonaria* Hoffm. and *Peltigera canina* Willd. between 2,130 m. and 2,440 m.; *Cladonia furcata* Schrad. at about 2,740 m.; *Parmelia conspersa* Ach. at 3,655 m.;

*Lobaria retigera* Trevis. between 4,000 m. and 4,500 m.; and *Stereocaulon tomentosum* Fr. at 5,000 m.

A few species are of economic importance. *Lobaria pulmonaria* Hoffm. is used for asthma and lung troubles, *Parmelia perforata* Ach. as a diuretic, *P. saxatilis* Ach. for epilepsy and *Peltigera canina* Willd. for hydrophobia and jaundice. Several species yield dyes: *Diploschistes scruposus* Norm., *Parmelia physodes* Ach. (a brown dye), *Gyrophora lecanocarpoides* Th.-Fr. *Umbilicaria pustulata* Tuck. (a red brown dye) and *Parmelia olivacea* Nyl. (a yellow dye). *Parmelia physodes* Ach. and *Ramalina fraxinea* Ach. are considered suitable substitutes for gum-arabic, and *Ramalina farinacea* Ach. and *R. fraxinea* Ach. are used for making cosmetics. *Lobaria pulmonaria* Hoffm. is used in tanning and brewery, and *Dermatocarpon moulinii* A.Zahlbr. is a substitute for cork for lining entomological collecting boxes. *Cladonia alpestris* Rabh. which occurs at higher elevations of the Himālayas, has been used in the Arctic areas as an article of food for the reindeer.

#### 10. Botanical Regions of India and their Floristic Compositions

In their *Introductory Essay to the Flora Indica*, Hooker and Thomson (1855) attempted a phytogeographical analysis of the Indian flora as a whole; this was later incorporated by Hooker in *The Imperial Gazetteer of India* (1907).

Hooker divided the then British possessions of India into nine botanical regions, using the number of species of the ten largest families in each region as the most important criterion for his classification. The nine regions are: (1) the Eastern Himālayas extending from Sikkim to the Mishmi hills in Upper Assam; (2) the Western Himālayas extending from Kumaun to Chitrāl; (3) the Indus plain including the Punjab, Sind and Rājasthān west of Arāvalli range and Yamuna river; Kutch; and Northern Gujarāt; (4) the Ganga plain, from the Arāvalli hills and Yamuna river to Bengal; the Sundarbans; the plains of Assam and the low country of Orissa north of the Mahānadi river; (5) Malabār, the humid belt of hilly or mountainous country extending along the western side of the Peninsula from Southern Gujarāt to Cape Comorin, including Southern Gujarāt, the southern half of Kāthiāwār, the Konkan, Kanara, Kerala and the Laccadive Islands, (6) the Deccan, the comparatively dry elevated tableland of the

Peninsula east of Malabār and south of the Ganga and Indus plains, together with, as a subregion, the lowlying strip of coastland extending from Orissa to the Tirunelveli District known as the Coromandel Coast; (7) Ceylon and the Maldivé Islands; (8) Burma; and (9) the Malay Peninsula. Hooker was not sure where to place the Andaman and Nicobar Islands.

In the delimitation of these areas, it is difficult sometimes to apportion large areas into one or the other of two contiguous botanical regions. This is to be expected, since the changes in environmental conditions are gradual and not sudden. For instance, the north-western half of Kāthiāwār is botanically similar to Sind, and the south-eastern to the Konkan. Nor is it possible to draw an absolute boundary line between the floras of the Indus and of the Ganga plains. A number of Upper Ganga plants intrude into the Indus plain and those of the Rājasthān desert into the Ganga plain. Again, the eastern limit of the Malabār region is undefinable, because of the number of spurs and valleys from its hills which project far into the Deccan region, almost crossing it. They carry with them types of the Malabār flora, which towards its northern limit, mingle with the floras of the Deccan and of the Indus and the Ganga plains.

Calder (1937) recognized only six main divisions of India: (1) the North-western Himālayas, (2) the Eastern Himālayas, (3) the Indus plain, (4) the Ganga plain, (5) the Deccan (with one eastern subprovince), and (6) Malabār.

Chatterjee (1939) based his divisions mainly on the endemic content of the dicotyledons in the different areas. He excluded Ceylon, the Maldives and Malaysia since these have floras distinctly different from the flora of India. Assam, which was included by Hooker in the Ganga plain region, was considered a separate region because of its distinctive flora (cf. Clarke, 1898). The Himālayas have been divided into three instead of two regions. Further, in consideration of the definitely older geological age of Peninsular India, the Deccan and Malabār regions have been regarded as floristically older. The revised floristic regions of Chatterjee, as applicable to present-day India (excluding Nepāl, Pākistān and Burma), are as follows: (1) Deccan, (2) Malabār, (3) Indus plain, (4) Ganga plain, (5) Assam, (6) Eastern Himālayas and (7) Western Himālayas. The Andamans, may be taken as the eighth botanical region of India.

From the point of view of their relatively low rainfall and humidity, the Deccan, the Indus plain, and the Western Himālayas show a marked contrast with Malabār, Lower Ganga plain,

Assam and the Eastern Himālayas. The striking floristic differences between these two groups of regions are, therefore, quite understandable. Altitude is the chief factor in the characterization of the mountain vegetation of India, particularly in the Himālayas. Soil is a factor of more local significance. The members of the Dipterocarpaceae can be cited as a good example of preferential distribution with reference to rainfall and soil. In *Dipterocarpus*, there are species which favour a drier environment, such as *D. obtusifolia* Teysm. and *D. tuberculatus* Roxb., and others which are of a more hygrophilous type such as *D. turbinatus* Gaertn. f., *D. indicus* Bedd., *D. pilosus* Roxb. and *D. alatus* Roxb. In general, these two groups show further contrast in that the xerophilous species almost always occur gregariously and are deciduous, while the hygrophilous species occur sporadically and are evergreen.

Peninsular India, one of the three regions into which India is divisible on the basis of the percentage of endemic species, floristically comprises the Deccan and the Malabār regions, both of which together have a high endemic content next only to the Himālayas.

**THE DECCAN REGION:**—This comprises the entire, comparatively dry, elevated tableland of the Peninsula east of Malabār and south of the Indo-Ganga plain. The hills of the Vindhya and Eastern Ghāts fall in this region. The Coromandel Coast extending from Orissa to Tirunelveli may be considered as a sub-region. Over the greater part of the Deccan region, the rainfall is less than 100 cm., and this amount is exceeded only in certain elevated parts which intercept the monsoon currents. However, the Coromandel subregion (also termed Carnatic subregion) receives the full benefit of the north-east monsoon and has a rainfall ranging from 62·5 cm. to 162·5 cm.

Among the palms of the Deccan region are *Phoenix sylvestris* Roxb., *P. robusta* Hook. f., *P. acaulis* Roxb., *P. humilis* Royle, *Calamus viminalis* Willd., *C. pseudotenuis* Becc., *C. rotang* L. and *Borassus flabellifer* L.

Successful *Casuarina* plantations have been raised along the coast on sandy soil.

**MALABĀR REGION :**—This comprises the excessively humid (rainfall, more than 200 cm.) belt of mountain country running parallel to the west coast of the Peninsula. It is mostly a hilly country, and except in the north, the mountains often rise abruptly from the flat coast of the Arabian Sea. Its abrupt western face is clothed with a luxuriant, evergreen forest merging towards the

drier north into the elements of the Deccan and the Indus plain floras. The eastern face slopes gradually into the elevated plateau of the Deccan but there are many spurs projecting far into the Deccan region, often enclosing valleys with a Malabār flora. A particularly great break occurs in the chain at the latitude of 11°N where a transverse valley separates Southern Kerala from the mountains north of it and carries species characteristic of the Malabār flora almost across the Peninsula. To this region belong the Nilgiri hills.

The endemic palms of this region are: *Pinanga dicksonii* Bl., *Bentinckia coddapanna* Berry, *Calamus rheedei* Griff., *C. huegelianus* Mart., *C. brandisii* Becc., and *C. gamblei* Becc. Among other wild palms are species of *Phoenix*, *Caryota*, *Calamus* and *Corypha*. Of the commercial crops the most important are betel-nut (*Areca catechu* L.), coconut (*Cocos nucifera* L.), palmyra (*Borassus flabellifer* L.), pepper (*Piper nigrum* L.), coffee (*Coffea* spp.) and tea (*Camellia sinensis* O. Ktze.). In more recent times *Hevea brasiliensis* Müll.-Arg. (rubber), *Anacardium occidentale* L. (cashew-nut) and *Eucalyptus* spp. have been introduced successfully in suitable areas of this region, rubber in the very humid regions, cashew-nut along the coast, and eucalyptus in the Nilgiri and other hills. The coconut forms a major element in the economy of the Kerala State and it is common to see this palm lining the lagoons and canals of the coastline.

The Indo-Ganga plain, which is the poorest in endemic content, is divisible into the Indus plain region and the Ganga plain region.

**INDUS PLAIN REGION:**—This region comprises the plains of Punjab, Rājasthān west of the Arāvalli range and Yamuna river, Kutch and Northern Gujarāt. The rainfall is less than 75 cm. generally and in the driest regions of the desert area less than 12·5 cm. in the year.

The only indigenous palms in the Indus plain region are *Phoenix sylvestris* Roxb. and *Nannorrhops ritchieana* H. Wendl. The latter finds its north-eastern limit in the Salt Range and the south-western limit in Sind and Baluchistān, both of which areas are now in Pākistān.

*Prosopis juliflora* DC. and *P. glandulosa* Torr. of the arid regions of Mexico and Central America have been successfully introduced in connection with the soil conservation and afforestation of dry and desert areas.

**GANGA PLAIN REGION :**—This region stretches from the Arāvalli hills and the Yamuna river eastward to Bengal, including the Sundarbans and the low country of Orissa north of the

Mahānadi river. The bulk of this tract has been under cultivation from very early times. The forests, where they exist, are of widely different types. The sal forests of Oudh are probably mere remnants of the great sub-Himālayan sal belt, which at one time covered a much larger area than now and stretched for some distance into the adjoining plains; the lower Ganga subregion, comprising both Bihār and Bengal, is much more humid than the upper region. *Areca*, *Phoenix*, *Borassus* and *Cocos* are cultivated; of indigenous palms mention may be made of *Corypha*, *Calamus* and *Daemonorops*. The third subregion comprises the Sundarbans, which borders on the Bay of Bengal. The chief plants here are: *Heritiera fomes* Buch.-Ham. (Sundri), *Excoecaria agallocha* L., *Sonneratia apetala* Buch.-Ham., *S. caseolaris* Engl., *Xylocarpus molluccensis* Roem., *X. granatum* Koen., *Amoora cucullata* Roxb., *Aegiceras corniculatum* Blanco, *Cynometra mimosoides* Wall., *Avicennia officinalis* L. and the mangroves *Ceriops tagal* C. B. Robbins, *C. roxburghiana* Arn., *Kandelia rheedii* W. et A., *Rhizophora mucronata* Lam. and *Bruguiera conjugata* Merr. The palm *Nipa fruticans* Wurmb. is gregarious in the swamps and on river banks, and *Phoenix paludosa* Roxb. is found in drier localities. A species of *Calamus* and another of *Daemonorops* are common.

**ASSAM REGION:**—This comprises the Brahmaputra and Surma valleys together with the intervening hill ranges—the Gāro, Khāsi and Jaintia hills, and also the Nowgong, Nāga, Pātkai, Manipur and Lushai hills on the eastern and south-eastern frontiers of Assam. Over the greater part of this region the rainfall exceeds 200 cm., while Cherrapunji in the Khāsi hills, with a normal rainfall of 1,080 cm., is reputedly the雨iest spot in the world. The vegetation is luxuriant and the valleys, where they are not under tea or agricultural crops, are clothed with expanses of tall savannah grass or with dense forest often of an evergreen type.

The hill forests of the Assam region approximate in type to those of the Eastern Himālayan region, except that there is no alpine zone. These hill forests may be separated broadly into evergreen forests, broad-leaved forests and pine forests.

Shifting cultivation has destroyed much of the natural forest growth on these hills. The hill-tops of the Assam region, like those of the Nilgiris, are open grasslands with trees and shrubs identical with or closely related to those of the Nilgiris. The mountains to the east are often covered with bamboos.

Among palms of narrow distribution in the Assam region are: *Areca nágensis* Griff., *Pinanga griffithii* Becc., *P. hookeriana* Becc.,

*Didymosperma nana* Wendl., *D. gracilis* Hook. f., and *Plectocomia khasiana* Griff. Besides these, there are a number of others of wider distribution, like *Wallichia densiflora* Mart., *Caryota* spp., *Licuala peltata* Roxb., *Phoenix* spp., *Daemonorops* sp., *Zalacca* sp. and several species of *Calamus*.

EASTERN HIMĀLAYAN REGION:—This region, extending from Sikkim eastwards, embraces the most humid portion of the Himālayan range. Darjeeling, Kurseong and other places are located in this part of the Himālayas. The Eastern Himālayan ranges, being at a somewhat lower latitude than parts of the Western Himālayas, are relatively warmer and the timberline, alpine flora and snowline are at slightly higher altitudes than in the Western Himālayas. More important is the humidity factor, precipitation being heavier in this part of the Himālayas. About 4,000 species of flowering plants are estimated to occur in this region, of which 20 are palms. Palms of this zone are species of *Wallichia*, *Licuala*, *Caryota*, *Daemonorops*, *Phoenix* and *Pinanga*. Sal, when present, occurs chiefly on the ridges, the intervening depressions being under mixed forests often with an abundance of *Dendrocalamus hamiltonii* Nees. At higher altitudes of this zone there appear two trees, *Betula cylindrostachys* Gamble and *Alnus nepalensis* D. Don.

The temperate zone of the Eastern Himālayas extends from 1,524 to 3,657 m. In the lower belt of this zone below 2,742 m. occur a large number of different broad-leaved species, including *Quercus lamellosa* Smith, *Q. lineata* Bl., *Q. pachyphylla* Kurz, and other oaks, *Castanopsis*, *Michelia excelsa* Bl., *Magnolia* and other Magnoliaceae, *Bucklandia populea* R. Br., *Cedrela*, many laurels and maples, alder, birch, *Pyrus*, *Symplocos*, *Echinocarpus*, *Elaeocarpus*, *Meliosma* and *Eurya*. Conifers occur mostly above 2,742 m. They are *Abies webbiana* Lindl., *Picea spinulosa* Beiss., *Larix griffithiana* Hort. ex Carr., *Tsuga brunoniana* Carr. and two junipers. Among other plants of this zone may be mentioned numerous rhododendrons and dwarf willows. The bamboo *Arundinaria recemosa* Munro forms a dense growth in places. Two palms also occur in this zone. One is a scandent rattan (*Plectocomia himalayana* Griff.) and the other a fan palm (*Trachycarpus martiana* Wendl.).

The alpine zone extends from 3,657 m. to about 4,876 m. Several species of rhododendrons occur here and junipers of the upper temperate zone also extend high into this zone.

WESTERN HIMĀLAYAN REGION:—This comprises the sub-Himālayan tract and the Himālayan range from Kumaun to

Kashmīr. In general, the Western Himālayas are much cooler and drier than the Eastern. The rainfall varies from 100 to 200 cm., although in some parts of the submontane tracts it reaches 250 cm. or more. These inner valleys and the north-western areas of this region have a dry climate. Naini Tāl, Mussoorie, Simla and Kashmīr fall under the Western Himālayan region.

The submontane zone and lower hills, up to 1,524 m. contain an almost continuous belt of sal forest in the eastern portion of the tract as far west as the Yamuna river and to a very small extent beyond. Savannah lands break up the sal belt at intervals. In the western part of this region the forest becomes drier in character, the prevailing species in the submontane tracts and outer hills being *Acacia modesta* Wall., *Olea ferruginea* Royle, *Carissa spinarum* L., *Dodonaea viscosa* L. and other xerophytic species. Among palms, only five species occur in contrast to several in the Eastern Himālayas. They are locally found in Kumaun and are *Phoenix sylvestris* Roxb., *P. acaulis* Roxb., *P. humilis* Royle, *Wallichia densiflora* Mart. and *Calamus tenuis* Roxb.

The temperate zone, extending from 1,524 m. to 3,657 m. contains extensive forests of conifers and broad-leaved temperate trees. In the lower elevations, *Pinus roxburghii* Sar. prevails. Soon it gives place to deodar (*Cedrus deodara* Loud.) and blue pine (*Pinus wallichiana* A. B. Jack.); higher up, spruce (*Picea morinda* Link.) and silver fir (*Abies pindrow* Spach.) make their appearance and form forests of large extent between 2,438 and 3,352 m. Of other conifers, the yew (*Taxus baccata* L.) is common in some localities. Cypress (*Cupressus torulosa* D. Don) is found locally, and the edible pine (*Pinus gerardiana* Wall.) occurs in the dry inner valleys. Oaks, chiefly *Quercus incana* Roxb., *Q. dilatata* Lindl., and *Q. semecarpifolia* Smith, maples (*Acer* sp.), horsechestnut (*Aesculus indica* Colebr.), poplar (*Populus ciliata* Wall.), elm (mostly *Ulmus wallichiana* Planch), alder (*Alnus nepalensis* D. Don and *A. nitida* Endl., the latter descending below the zone), birch (*Betula alnoidea* Ham.), *Cornus*, *Prunus cornuta* Wall., *Rhododendron arboreum* Sm., and other trees occur. One species of *Trachycarpus* is the only palm occurring in the temperate region and is confined to Kumaun and Garhwāl.

The alpine zone extends from the upper limit of the temperate zone to about 4,572 m. or sometimes higher. The characteristic trees of this zone are the high-level silver fir, the silver birch (*Betula utilis* D. Don), and junipers. Unlike the Eastern Himālayan region, rhododendrons are far less numerous, being represented by only three species.

ANDAMAN REGION:—The flora of the Andaman and Nicobar Islands is related with that of Burma and Malaysia. The hilly tracts do not exceed 731 m. in height. Among palms, *Daemonorops manii* Becc., and *D. kurzianus* Hook. f. are endemic in the Andaman Islands. Four species of palms are endemic in the Nicobar Islands. They are *Ptychosperma angusta* Becc., *Bentinckia nicobarica* Becc., *Calamus nicobaricus* Becc. and *C. unifarius* Wendl. *Calamus andamanicus* Kurz, and *Pinanga manii* Becc. are endemic in both the Andaman and Nicobar Islands.

The main types of forests in this region are mangrove forests, beach forests, evergreen, semi-evergreen and deciduous forests and diluvial forests. The mangrove forests are similar to those found on the Indian mainland.

#### 11. Some Alien Flowering Plants

With land connections on three sides, north, east and west, India has acquired a number of plants of other countries. The Himalayan range in the north has no doubt been a barrier; but there are passes in the north-west of Pākistān and north-east of India and they make a limited spread of plants possible. The areas that have contributed most to the alien elements in the Indian flora are Burma, Malaysia, South-west China, Eastern China, West Asia and Africa.

Hooker (1855) recognized the following principal elements in the Indian flora : (1) the Malaysian element which is the most dominant; (2) the European-Oriental element; (3) the African element; (4) the Tibeto-Siberian element; and (5) the Sino-Japanese element. The subcontinent was considered essentially a meeting place of floras from the west, north and east, and with little botanical character of its own. The then known endemic element was small but we have already shown that this is incorrect. Peninsular India and the Himalayas show a high degree of endemism and hence of floristic distinctiveness. It may be added that almost all the nineteenth century botanists including Hooker obtained a biased view of tropical flora, starting as they did with the impoverished temperate floras of their own countries. The flora of Europe was taken as a starting-point with which floras of newly explored tropical lands were compared. Wulff (1950) said: "Thus Hooker (1855) finds in the flora of the Himalayas and Northern India a European element only because the species forming it are likewise found in the flora of Western Europe,

although, of course, it is perfectly clear that the centres of areas of these species lie precisely in the Himālayas, whence in post-glacial times they spread to Europe. Hence, this element might be designated as Himālayan in the flora of Europe but in no case as a European element in the flora of India."

Ridley (1942) made certain observations on the Indian flora with reference to the ancient Oligocene flora of the world. The Magnoliaceae, Lauraceae, Hamamelidaceae, Cupuliferae, Salicaceae, Ranunculaceae, Berberidaceae, Hypericaceae, Ternstroemiacae, Rosaceae, Umbelliferae, Cornaceae, Primulaceae, Styracaceae, Gentianaceae, Boraginaceae, Chenopodiaceae, *Engelhardtia*, *Carex* and some other plants had a wide distribution in the Cretaceous times over the entire northern part of the world up to the arctic region. In India, this flora is now practically limited to the Himālayas. Rarely, however, some representatives of these families are seen as far southwards as the mountains of Java and Sumatra.

A considerable flora in the tropical parts of India, consisting chiefly of trees and shrubs of the rain forest type, extends from Malaysia through India to North Africa and reappears in Eastern South America. This flora seems to have originated in the Oligocene period, or at least was in existence even then as far north as Southern Europe. It has now largely disappeared in the heavily populated and long cultivated regions of India and Central Africa and only some relics are preserved in remote mountainous areas. We have additional proofs of the lost forest flora of the Indo-Ganga plain in the presence of the peacock and the ape, both forest-lovers, and preserved only for religious motives. Among the genera of this category we may mention: *Tetracera*, *Salmania*, *Eriodendron*, *Sterculia*, *Buettneria*, *Erythroxylon*, *Zizyphus*, *Casearia*, *Buddleia*, *Vitex*, *Tragia*, *Elatostemma*, *Burmannia*, *Xyris*, *Sciophila* and many others. *Rhipsalis* is interesting as the only representative of the Cactaceae in the Old World.

After the Miocene the eastern end of the Mediterranean Sea became closed up, desert formation occurred in Arabia and Baluchistān (Pakistān) and a desert flora invaded Sind (Pākistān) and Rājasthān and even as far down as the south. Very characteristic of such desert plants are the Salvadoraceae (*Azima* and *Salvadora*), *Dodonaea*, *Acacia*, *Heliotropium*, *Indigofera*, Crassulaceae, Zygophyllaceae, Capparidaceae and many desert Cruciferae and grasses. Many of the weeds of cultivation common in waste ground all over India are probably due to the invasion from this region.

A number of plants found in Ceylon have come along the South of Asia but have not reached India proper. They show a former land connection between the Malay Islands—probably Sumatra and Ceylon. Of these, the most interesting are *Acrotrema*, *Anaxagorea*, *Cullenia*, *Kurrimia*, *Pometia pinnata* Forst f., *Timonius koenigii* Bl., and *Lagenophora billardieri* Cass. Most members of the Annonaceae and Menispermaceae of Ceylon have affinities with those of Malaysia and not India.

A large proportion of the maritime plants of India seem to have evolved in the coral islands of Polynesia and Malaysia. Their seeds must have drifted along the south coast of Asia, settling on the shores of Ceylon and the Coromandel Coast of India. Some passed on even to East Africa and its islands. Such plants are *Calophyllum inophyllum* L., *Ochrocarpus*, *Samadera*, *Xylocarpus granatum* Koen., *Colubrina asiatica* Brongn., *Desmodium umbellatum* DC., *Derris uliginosa* Benth., *Intsia bijuga* O. Ktze., *Rhizophora candelaria* DC., *Bruguiera sexangula* Pers., *Pemphis*, *Scyphiphora*, *Guettarda*, *Wedelia biflora* DC., *Ochrosia*, *Tournefortia argentea* L. f., *Avicennia officinalis* L., *Cassytha*, *Hernandia*, *Flagellaria*, *Remirea maritima* Aubl. and *Spinifex littoreus* Merr., *Heritiera* and a species of *Dolichandrone*, *D. spathacea* K. Schum., have travelled from the Indian region as far as the Philippines and New Caledonia by sea.

The genus *Scaevola* is mainly Australian. Two of its species, *S. frutescens* Krause and *S. plumieri* Vahl, have spread to the coasts of Peninsular India.

The palm, *Nipa fruticans* Wurmb., is now found in the Bay of Bengal and along Malaysia as far as the Solomon Islands, but is quite absent from Africa and America. In Eocene time, an almost identical species was abundant in Southern England and along the Mediterranean as far as Cairo. *Acanthus ilicifolius* L. and *A. volubilis* Wall. of the Sundarbans and coasts of India had a closely related species in the Isle of Wight in the Oligocene time.

Ridley (1942) states : "No story of plant distribution is complete without a considerable knowledge of tertiary palaeobotany nor can be understood without a comprehension of the position and form of land surfaces during that period, the time of the evolution of flowering plants. The modern Asiatic flora is probably what remains of the Oligocene flora which probably occupied all tropical regions as far north as Europe." Many of the early genera and perhaps families have disappeared on account of the vicissitudes of climatic and geological changes, but some species of that date

seem to have persisted, with little or no alterations, to the present day. Further researches are needed to correlate the extinct and the living groups of flowering plants and probably to fix the date and place of origin of the present Indian flora, and indeed of the floras of the world at large.

Some 38 per cent of the Indian flowering plants have immigrated from foreign lands at various times in the past and have since become naturalized. Some of these aliens have become so well naturalized and successful as to appear really indigenous.

A number of plants originally under cultivation in gardens and fields are now found as escapes that have become thoroughly established by natural agencies like wind, water and animals. Typical examples are: *Lantana camara* var. *aculeata* Mold., *Ipomoea angulata* Lam., *Ageratum conyzoides* L., *Eupatorium glandulosum* H.B. et K., *Helianthus annuus* L., *Tithonia tagetiflora* Desf., *T. diversifolia* A. Gray, *Barleria cristata* L., *Adhatoda vasica* Nees, *Clitoria ternatea* L., *Jatropha gossypifolia* L., *Pedilanthes tithymaloides* Poir., *Eichhornia crassipes* Solms, *Peperomia pellucida* H.B. et K., *Cryptostegia grandiflora* R. Br., *Agave augustifolia* Haw., *Opuntia cochinellifera* Mill. and *Dioscorea alata* L.

Man has been responsible for the import of many alien plants, in some instances deliberately, in others by chance. History tells us that the early Aryan settlers from the countries lying north-west of India brought with them a number of economic plants. It is quite likely that several other plants travelled with them as camp followers, with their seeds or other propagules either mixed with those of the economic plants or stuck to the bodies of the sheep and cattle which these pastoral tribes from the north brought with them. Thus, from almost the dawn of civilization man has been changing the flora of this country by clearing the ground of its primary vegetation and introducing aliens by accident or on purpose.

The great majority of naturalized plant aliens are troublesome weeds competing with cultivated plants or otherwise affecting human welfare. Only in a few instances it is possible to date the actual arrival of a species.

Some weeds have been introduced in comparatively recent times. They have come with foodgrains, ballast, packing materials and seeds of economic plants, or merely by adherence to the clothing of man and the hair of domestic animals. When they arrived in their new homes, they were further distributed by natural causes like wind and water. Their naturalization might

have been further aided by deforestation, faulty methods of pasturage and harvesting, shifting cultivation, construction of roads and railway lines, and continued sowing of impure seed. *Croton bonplandianum* Baill. is a familiar example of a weed which is now widespread in this country. About the year 1897 a ship arrived at Chittagong (now in East Pākistān) from La Plata with a ballast of mud from South America. To get rid of the mud, it was supplied to a local gardener for soil. That mud contained seeds of this plant; they germinated, and the seedlings flowered and fruited. The plant gradually travelled along railway lines and by steamer to Calcutta and is now a common weed chiefly along rail tracks, roads and canal banks. A similar history attaches to the introduction of *Eupatorium odoratum* L. from the West Indies to India, East Pākistān and Burma, by seeds confined to the ballast heaps of cargo boats calling at Singapore. During recent years it has been seen in the teak plantations of the Kerala State. It is believed that the seeds were brought down to Kerala from Assam by labourers returning from the Assam front after the Second World War. The seeds stuck to their beddings and clothes, thus bridging the long distance from Assam to Kerala. The seeds of *Argemone mexicana* L., now widespread in the tropical parts of the world, are said to have been borne to distant places in ship's ballast from Mexico and the West Indies. Recently, another species of this genus, *A. ochroleuca* Sweet sub-sp. *ochroleuca*, has also been found in India. *Aeschynomene americana* L., a native of the West Indies and tropical America, has been recorded from the Hazāribāgh area. It is possible that a few viable seeds of this species might have reached India along with some packing material during the Second World War, when a large number of American army units were stationed in various parts of India.

*Lantana camara* var. *aculeata* Mold. and *Eichhornia crassipes* Solms are two remarkable examples of plants which were wilfully introduced to this country as ornamentals but subsequently became so well naturalized as to become serious pests. *Lantana* grows rapidly to form impenetrable thickets in forest lands, and these are difficult to clear by hand because of the prickles on the branches of the plants. Birds feed on the fruits and account for the rapid dispersal of the seeds. *Eichhornia crassipes* Solms (water hyacinth) is a native of the Amazon region of Brazil but is now widespread in Tropics throughout the world. It was brought into India towards the end of the 19th century and soon established itself so successfully that it became a nuisance. Hence its nickname, "Terror of Bengal". It grows gregariously, floating on water or rooted when

stranded on wet soil. Rapid vegetative propagation accounts for its profusion, although seeds are also produced. The thick growth of the plant hinders navigation in water channels, chokes drainage, and provides a breeding ground for mosquitoes that spread malaria and other diseases. Eradication of this pest by hand is very laborious. In recent years, certain hormones have been effectively used in some countries for the eradication of this troublesome pest.

The prodigious spread of some of these recent introductions is viewed with awe. To *Lantana* and *Eichhornia* may be added, among others, *Hyptis suaveolens* Poit. which covers whole hill-sides in Western India and other parts of the country, and *Acanthospermum hispidum* DC. which has spread over very large areas in Gujarāt and other parts of India. These alien new-comers find conditions very suitable for their growth and propagation ; at the same time they are free from their natural enemies (insect, animal or plant), which in their native countries keep the plants under control. The alien weed has been imported into India, but generally its enemies have been left behind.

The introduction, spread and eventual control of the prickly pears (*Opuntia*) in India is a long and eventful story. Although no record exists to show when the first alien *Opuntia* reached this country, it must have been well before 1800 A.D. since by then it had become widespread in certain parts of India. It is narrated that sailing boats carried the stem of prickly pears to serve as vegetables at a time when anything green, not actually poisonous even if unpalatable, was used to prevent scurvy among sailors. *Opuntia* may thus have found its way from the New World into India via Europe. It is on record that small enclosures, bounded by hedges of *Euphorbia* and *Opuntia*, caused the entanglement of Tipu's horse in the battle of Poongar on the banks of the river Cauvery on September 12, 1790. The practice of making fences out of prickly pears, and the natural dispersal of their seeds by birds after they had eaten the fruits, greatly contributed to the spread of the plants. A long fence of this kind, called the "Salt Wall", was made over miles of the Rājasthān border to prevent smuggling. Prickly pears were also used for the protection of young shade trees along roadsides. All this afforded the plants many new starting points for fresh encroachment and they gradually became a serious pest of garden and field. In some places they formed dense thickets, an excellent shelter for snakes. At the end of the 18th century, the East India Company tried to establish in this country a cochineal dye industry which was till then a Spanish monopoly in America. The cochineal insect feeds on

species of *Opuntia* and through the efforts of the Company, in collaboration with Dr. James Anderson at Madras and Dr. William Roxburgh at Calcutta, several new species of *Opuntia* were introduced into cultivation in India, along with the cochineal insect. However, the production of the dye was not satisfactory and by 1810 the Government was compelled to discontinue the project, although attempts to introduce cochineal continued till 1883. The insect, introduced into India in 1795, was a blessing in disguise. It spread rapidly on plants of *O. monacantha* Haw. devouring them branch and root, and in the course of twenty years annihilated this pest in South India almost totally. In the north, it took about sixty years for the insect to spread from Bengal up the Ganga plain and over the Indus plains more than 1,200 km. away. *Opuntia monacantha* Haw. had by then become a pest in the Punjab. Sher Singh, ruler of Lahore, inflicted fines on people who allow this plant to grow on their grounds. Within a year of the invasion of the Punjab plain by the cochineal insect, the prickly pear in the area was thoroughly destroyed and a large supply of dye was available to the local Kashmiri dyers. *Opuntia monacantha* Haw. is now comparatively rare. *Opuntia dillenii* Haw. and *O. elatior* Mill., on the other hand, were immune to the species of cochineal insect originally introduced into India. In comparatively recent times, other species of the cochineal insect were imported into South India in an attempt to eradicate *Opuntia dillenii* Haw. in particular. This measure was successful in bringing this pest also under control.

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## CHAPTER V

### FAUNA

#### 1. *Faunal and Zoogeographical Characteristics*

IN THE LAST EDITION of *The Imperial Gazetteer of India* (1907), the chapter on Zoology dealt only with the "principal Vertebrate animals of India"; and the Invertebrates were not dealt with at all. Since then, there has been a large accumulation of data on Indian fauna, particularly the invertebrates; in the number of species and varieties, the invertebrates comprise the bulk of our fauna. The present account includes both the vertebrates and invertebrates; a brief review of the faunal characteristics of India; game animals and the preservation of wild life; and the basic ecological balance between man and wild life. A number of the smaller invertebrate phyla, such as Bryozoa, Rotifera, Phoronida, Brachiopoda and Chaetognatha have had to be omitted.

Before we go into the characteristics of Indian fauna, it would be appropriate to say a word on the geographical, physical and climatic background. India lies in the subtropical belt between latitudes 8° 4'N. and 37° 6'N. and longitudes 68° 7'E. and 97° 25'E. Its land area exceeds 3 million sq. km. That includes, in addition to the main land-mass of India, the islands in the Bay of Bengal (the Andamans and the Nicobars) and the Arabian Sea (the Laccadive, Minicoy and Amīndīvi Islands). Faunistically, however, Pākistān, Nepāl, Burma and Ceylon are inseparable from India, and the entire "Region" has to be treated as a single unit.

The physical and climatic characteristics of the area vary enormously, and many different kinds of habitats are found. The elevation varies from the plains to the highest mountains in the world. The air temperatures vary from tropical, uniformly high ones to extremes of heat and cold. The vegetation changes from tropical evergreen forests to arid desert tracts. While the continental land-mass of North India and Burma, including the Himālayas, have only recently (speaking geologically) emerged from the sea, most of the peninsular portion is of great antiquity and there is no evidence of its ever having been under the sea.

The fauna of this Region, extremely varied as it is comprises all the major groups of the animal kingdom. Nearly 76,000 species of animals have been listed here and they form 8·2 per cent of the known living world species (c. 920,000) (Roonwal, 1959). While the vertebrate fauna of India is well known, and there is little possibility of new species being discovered except in certain mammals (smaller rodents and bats) and Amphibia, at least one-half of the invertebrate fauna still remains to be discovered.

The region has certain specialized faunas—animals in certain environments have developed special adaptations. For instance, fishes living in torrential streams have developed suckers with which to hold on to the rocks; and cave-dwelling insects have lost their eyes and developed extra-long feelers. Thus we have what may be called cave fauna, desert fauna, torrential stream fauna, river fauna, mangrove-swamp fauna, estuarine fauna, backwaters fauna, pond and lake faunas, littoral or beach fauna, hot-springs fauna and relict fauna. The last named is of unusual interest. We have in the Abor country in the North East Frontier Agency an ancient Arthropod, the Onycophoran *Typhloperipatus williamsi* Kemp—a small, soft-bodied, slug-like, primitive Arthropod which has remained unchanged through millions of years.

In 1858 Sclater divided the world into six zoogeographical regions. These were so well based that they are substantially accepted today. The regions were:

*Creatio palaeogaea*:

1. Regio palaearctica
2. Regio aethiopica
3. Regio indica
4. Regio australiana

*Creatio neogaea*:

5. Regio nearctica
6. Regio neotropica

Later authorities have made subdivisions of Sclater's major regions, and the following broad classifications as given by Beaufort (1951) may be accepted. Three major divisions (Arctogaea, Notogaea and Neogaea) with 7 regions and a number of subregions are recognized as follows :

*A. Arctogaea*:

1. Holarctic region—

- (a) Palaeartic subregion. (Iceland, Europe, northern tip of Africa, Asia, north of India and excluding Southern Arabia.)
- (b) Nearctic subregion. (North America and Greenland.)

2. Ethiopian region—
  - (a) African subregion. (Africa, excluding the northern tip and Arabia.)
  - (b) Madagascar subregion. (Madagascar.)
3. Oriental (or Indian) region. (Tropical part of Asia, e.g., India except north-western part, Ceylon and east up to Borneo and the Philippines, but excluding Celebes and further east.)

*B. Notogaea :*

4. Australian region.
5. New Zealand region.
6. Oceanic Islands region.

*C. Neogaea :*

7. Neotropical region. (Central and South America.)

While the occurrence of the Palaearctic and the Oriental elements in the Indian fauna has been well established, recent evidence shows that small amounts of the African (Ethiopian) and even the South American (Neotropical) elements are also found. A few groups may be taken to illustrate the origins of the Indian fauna.

*Fishes*: Hora (1937) showed that the freshwater fish fauna of India originated in South East Asia. In consequence, the river systems of North India (the southern drainage of the Himālayas), as they arose, were populated from the east. There is a difference between the northern (Central Asian) and southern (North Indian) drainages of the Himālayas. The northern rivers run through broad beds and often expand into lakes and marshes, whereas the southern rivers, fed by more plentiful rain, are torrential; hence special adaptations for holding on to rocks are to be found among fishes in the south. The same genus may occur in the north and the south, but the species are different. The North Indian fauna is more akin to the fauna of South East Asia, and has been prevented from going north to Central Asia by the Himālayan barrier.

Horā (1938) further postulated that the elevated Sātpura area, which in the Miocene times ran diagonally across India to the Himālayas, permitted the dispersal of hill-stream fishes from the Western Ghāts and the hills of South India (examples : *Bhavania*, *Silurus*, *Parapsilorhynchus* and *Thynnichthys*). Beaufort (1951), however, believes that this extension must have occurred earlier, especially in *Thynnichthys*.

Many of the marine fishes of India are believed to have originated in the Malaya Archipelago (Ekman, 1953).

For Amphibia and reptiles, dispersals have been slow and gradual, compared to the birds, mammals and insects, occurring mostly in times of flood and other fortuitous happenings. Past geography and geology—contiguity or otherwise—are more important in understanding present-day distributions in reptiles and Amphibia than in the more active animals.

Smith (1931) states that it is the past contiguity of land areas which explains the existence of numerous species in common between the Malay Archipelago and the mainland of Asia. The present distribution of the gharial, *Gavialis gangeticus*, and the freshwater turtles, *Chitra* and *Pelochelys*, in river systems which are today not connected, can be explained by their past connections. Similarly, the present-day discontinuous distribution of several species, both in the hills and the lowlands, is explicable on the basis of a former continuous distribution over a large area. Thus, the hill tortoise, *Testudo elongata* Blyth (synonym: *T. parallelus* Annand.), occurs in isolated patches in Vietnam, Burma, Thailand, Chota Nāgpur plateau and Malaya. It is unlikely that the Chota Nāgpur forms crossed the Ganga plains to reach Indo-China, Burma and Malaya. In snakes there is an important element in common with the Neotropical region but absent elsewhere—these are the families Anilidae and the subfamilies Dipsadinae and Xenoderminae of the family Colubridae, and a genus of the Viperidae.

**Birds:** From a recent analysis Moreau (1952) concluded that Africa has been the centre of evolution of the South Asian avifauna. Ripley (1953) has supported this hypothesis and shown that while the Indian avifauna is overwhelmingly Oriental in character and has some Palaearctic element, the African or Ethiopian element is also considerable. Out of 176 endemic species, 17 per cent are Palaearctic, 17 per cent Ethiopian and 62 per cent Indo-Chinese.

**Mammals:** Among Indian mammals there are several genera which are typically Oriental. A few of these are: *Elephas*, *Bubalus*, *Boselaphus*, *Antelope*, *Nemorhaedus*, *Moschus*, *Hylobates*, *Presbytis*, *Loris*, *Nycticebus*, *Neofelis*, *Ailurus*, *Manis*, *Funambulus*, *Ratufa*, *Hadromys*, *Golunda* and *Rhizomys*. There is also a considerable amount of the Palaearctic and Ethiopian elements. It is interesting to note that typically African animals such as the giraffe and hippopotamus once roamed Northern India and their fossil remains have been found in the Pleistocene fauna of the Siwālik hills.

In conclusion, it may be stated that Indian fauna consists of three principal elements—a large proportion of the Oriental

element, and fair amounts of the Palaearctic and Ethiopian elements. Finally, a small proportion of the Neotropical (South American) element also exists. This is especially evident in the snakes as discussed above, and is also shown by certain insects. For instance, the termite genus *Anoplotermes*, which has hitherto been found mainly in South America, with a few representatives in Africa, has recently been discovered in Assam where it is represented by a single species. (Roonwal and Chhotani, 1959, 1960).

## 2. *Types of Animals Found in India*

All the known major phyla of the animal kingdom, from the microscopic Protozoa to the largest mammals, are represented in the Indian region. Some phyla, like the Rotifera, are represented by only a few species; others, such as fishes, birds and mammals by hundreds; and still others, such as molluscs and insects, by thousands. It is convenient to have two major divisions—the Invertebrata and Chordata (which includes the Vertebrates). Representatives of the various major phyla found in our region will now be briefly reviewed—for want of space the minor phyla are excluded.

### *Division A: THE INVERTEBRATA*

#### (i) PHYLUM PROTOZOA

This includes the tiny, microscopic unicellular (or according to some acellular) creatures with the simplest organization. Our knowledge of these animals in India is still very poor. They are either free-living forms in the soil, in freshwater and marine environments (pelagic as well as benthal) or parasites in the body of both vertebrates and invertebrates. The latter are causative organisms of diseases, such as malaria and amoebic dysentery. Among free-living forms may be mentioned *Amoeba*, *Euglena*, *Paramecium* and *Noctiluca*, the last named being a pelagic marine phosphorescent form which is responsible for the phosphorescence seen in our seas.

(ii) PHYLUM PORIFERA  
(Sponges)

This is a small group of primitive, sessile aquatic animals which live in fresh water as well as in sea-water. Sponges live in small or large "colonies" which assume various shapes—a rounded ball, a cup, stalks with branches and thin encrustations on a substrate. Three classes are recognized, viz., Calcareae (Calciospongiae), Hexactinellida (Triaxonida or Hyalospongiae) and Demospongiae. About 300 species occur in India. Of these, the family Spongillidae (class Demospongiae), with about 25 species and a few sub-species, inhabit fresh water; many of the species belong to the genus *Spongilla*.

(iii) PHYLUM COELENTERATA  
(Polyps, medusae, jelly-fishes, sea-pens, sea-anemones and corals)

This is a group of primitive soft-bodied aquatic (with mostly marine, and a few freshwater) forms which is well represented in the Indian region by about 800 species. Three main classes are recognized :

*Cl.1. Hydrozoa* (*Hydromedusae*) (polyps and medusae) : Two species of freshwater polyps, *Hydra oligactis* and *H. vulgaris*, are found in India. A freshwater medusa, *Limnocnida indica* Annand., is known from the rivers and lakes of Peninsular India. All the remaining members of the class are marine, and among the more common forms may be mentioned *Campanularia nolliformis* and *Laomedea (Obelia) spinulosa*.

*Cl.2. Scyphozoa* (*Scyphomedusae*) (jelly-fishes) : Among the common jelly-fishes of our seas may be mentioned *Aurelia solidia* and *Crambionella annandalei*.

*Cl.3. Anthozoa* (*Anthomedusae*) (corals and sea-pens) : This class is well represented in our seas by the Alcyonacea (soft corals, e.g., *Dendronephthya* spp.), the Gorgonacea (horny corals, e.g., *Melitodes ornata*), the Pennatulacea (sea-pens, e.g., *Pennatula indica*), the Madreporaria (stony corals, e.g., *Flabellum stokesi*, *Fungia danai*, etc.).

(iv) PHYLUM PLATYHELMINTHES  
(Flatworms)

This phylum includes worms which are compressed dorsoventrally and possess no body cavity, the space being filled

with undifferentiated parenchymatous cells. They have free-living and parasitic modes of life. Three existing classes are reviewed below.

*Cl.1. Turbellaria* (free-living flatworms) : Normally free-living, sometimes commensal or parasitic. Available on land, in fresh water and in the sea. Common Indian examples belong to the genera *Planaria*, *Bipalium*, *Pelmatoplasma* and *Dolichoplana*.

*Cl.2. Trematoda* (parasitic flatworms) : Exclusively parasitic worms—some, attaching themselves to the superficial parts of the host, are ectoparasites while others, penetrating the internal parts of the host (both vertebrates and invertebrates) and settling down in some internal organs, are endoparasites.

Three orders are recognized: Monogenea, Digenea and Aspidogastrea.

- (i) Monogenea : It includes ectoparasites only. The genera, *Diclidophora*, *Diplozoon*, *Gyrocotyle* and *Pricea* are commonly found on fishes while *Polystomum* is reported from the frogs.
- (ii) Digenea : It is the largest group among the trematodes and includes endoparasites, some of which cause serious diseases of man and other animals. *Fasciola gigantica* Cobbold and *Fasciola indica* Varma, commonly known as liver-flukes heavily infest bile ducts of sheep, goat, cattle and camel, and cause liver-rot. *Fasciolopsis buski* (Lankester) infests human beings through infected *Trapa* fruits. *Schistosoma haematobium* (Bilharz) occurs in human blood and causes a serious disease "Schistosomiasis". *Schistosoma indicum* Montgomery occurs in cattle, goat, sheep, horse, ass and camel. Amphistomes (*Paramphistomum* and *Cotylophoron*) commonly infest the rumen of cattle, goat and sheep.
- (iii) Aspidogastrea : It is the smallest group, including parasites of vertebrates and invertebrates. Genus *Aspidogaster* is fairly common in India and several forms have been reported. *Aspidogaster indicum* Dayal occurs in the freshwater fish *Barbus*.

*Cl.3. Cestoda* (tapeworms) : They commonly possess a long tape-like body with head (scolex) bearing, in many forms, an armature of suckers and hooks; the body is divided into numerous segments. In adult stage, they infest the intestines of vertebrate animals. *Taenia solium* Linn, and *Taenia saginata* Goeze commonly parasitize the human intestine. *Echinococcus granulosus* Batsch, the larval form of which is termed "Hydatid cyst", occurs

in the liver of human beings and other mammals. Among the other genera parasitizing cattle, goat and sheep may be mentioned *Avitellina*, *Moniezia* and *Stilesia*.

#### (v) PHYLUM ASCHELMINTHES

This includes vermiform animals either unsegmented or with superficial segmentation. These may be free-living or parasitic in other animals. Six main classes are recognized : Rotifera, Gastrotricha, Kinorhyncha, Priapulida, Nematoda and Nematomorpha.

*Cl.1. Rotifera* : These are minute animals occurring in ponds and pools and are characterized by the possession of a ciliated trochal disc which serves for locomotion and food collection.

*Cl.2. Gastrotricha* : This is a small group of minute forms occurring in fresh water. These are unsegmented, worm-like, and bear resemblance to Rotifera.

*Cl.3. Kinorhyncha* : This class includes minute forms devoid of cilia but more or less spiny. The body consists of 13-14 segments with superficial segmentation. They are found at the bottom of littoral zone in the shallow water of the sea.

*Cl.4. Priapulida* : This group includes marine animals of moderate size. The body is characterized by the possession of a proboscis introversible into the interior and a distinct trunk.

*Cl.5. Nematoda* (roundworms) : They include aquatic, terrestrial or parasitic vermiform animals. Genus *Ascaris* is well represented in numerous vertebrate hosts. *Ascaris lumbricoides* Linn. parasitizes the human intestine (of both adults and children). *Ancylostoma duodenale* (Dubini) (hookworm), *Dracunculus medinensis* (Linn.) (guinea-worm), *Enterobius vermicularis* (Linn.) (pin-worm) and *Trichuris trichiura* (Linn.) (whipworm) commonly infect man. *Wuchereria bancrofti* (Cobb) causes "Elephantiasis" (filariasis) in man. *Strongylus equinus* Müller occurs commonly in the alimentary canal of horses and donkeys. Besides these, several genera of soil-inhabiting Nematodes, *Anguillulina*, *Aphelenchoides*, *Aphelenchus* and *Heterodera*, cause severe damage to the crops and are of great economic importance.

*Cl.6. Nematomorpha* (Gordiacea) : A small group of animals whose members are both terrestrial and aquatic (freshwater as well as marine). They are elongated and thread-like but normally the entire body rests in irregular coils.

(vi) PHYLUM ACANTHOCEPHALA  
(Spiny-headed worms)

This group includes endoparasitic, elongated worms with protrusible proboscis provided with numerous hooks. *Acanthogyrus* occurs in the alimentary canal of the fish rohu (*Labeo rohita*). *Echinorhynchus gigas* Van Cleave commonly infests the pig. *Moniliformis* is widely represented in terrestrial mammals, chiefly rodents.

(vii) PHYLUM ENTOPROCTA

This group includes small forms (solitary or colonial), either stalked or sessile. The distal end is modified into a lophophore (a circlet of ciliated tentacles), while the mouth and anus open inside the tentacular circlet. Genus *Urnatella* is available from fresh-water locations.

(viii) PHYLUM ANNELIDA  
(Polychaetes, earthworms and leeches)

This phylum of free-living, annulated worms is divisible into two classes: Chaetopoda and Hirudinea.

*Cl.1. Chaetopoda* : Has 3 orders, a small one (Archiannelida) and two large ones.

- (i) Archiannelida: A small order consisting of small marine worms occurring on the shore. Three genera, *Polygoradius*, *Protodrilus* and *Saccocirrus*, have been recorded from the eastern shores of India.
- (ii) Polychaeta : Worms with numerous bristles on parapodia. About 450 species are known from the Indian region—some are freshwater and brackish-water forms, others marine. Among the former may be mentioned *Lycastis indica* Sthn., and the species of *Dendronereis* and *Nereis*. Among the marine forms are *Aphrodita talpa* Quatr., *Chloea flava* (Pall.), *Perinereis nuntia* (Savig.) and many others.
- (iii) Oligochaeta (earthworms): They are worms with only a few small bristles on the body, have no feet or parapodia, and are hermaphrodites. They inhabit mostly freshwater or damp earth. Eight families, 50 genera and about 350 species are known from the Indian region, the largest

family being the Megascolecidae. Among the commonest earthworms of India are *Pheretima posthuma* (L. Vaill.), *Eutyphaeus nicholsoni* (Bedd.), *E. waltoni* Michael, and species of the genera *Megascolex* and *Drawidia*.

*Cl.2. Hirudinea* (leeches) : The leeches are a small class of which only 4 families and about 50 species occur in India. Three orders are recognized: Acanthobdella (absent in India), Rhynchobdella and Arhynchobdella.

Rhynchobdella : They are leeches which suck blood and juices of the prey by means of a protrusible proboscis. Two families (Ichthyobdellidae and Glossiphonidae) and about 23 species occur in our region.

Arhynchobdella : They are jawed leeches without a proboscis and are either freshwater or terrestrial, never marine. Two families and about 27 species occur in India.

#### (ix) PHYLUM ARTHROPODA

(Millipedes, centipedes, insects, crabs, prawns, spiders, scorpions, ticks, mites, etc.)

This is by far the largest phylum in the animal kingdom and contains over two-thirds of the known species. Economically also it is the most important group. It contains the insects and mites which are serious pests of agriculture and also act as carriers of many serious diseases in man and animals. Of the 12 classes into which this phylum is generally divided, the more important ones are the Xiphosura, Onychophora, Arachnida, Crustacea, Diplopoda, Chilopoda and Insecta.

*Cl.1. Xiphosura* (Merostomata—king-crabs) : An ancient class of marine animals of which only a few species are now left. The body is covered with a thick, dark brown shield. Two species of king-crabs occur on the east coast of India—*Tachypleus gigas* (Müll.) (syn. *Limulus mollucanus* Lat.) and *Carcinoscorpius rotundicauda* (Lat.).

*Cl.2. Onychophora* (Peripatus) : They are small, slug-like, terrestrial animals. A single species, *Typhloperipatus williamsoni* Kemp, lives in the Abor hills, North-eastern India. It is a relict species, having survived unchanged for millions of years.

*Cl.3. Arachnida* (spiders, scorpions, ticks and mites) : This class is divided into 10 orders of which the important ones are Scorpiones, Araneae and Acarina.

**Scorpiones (scorpions) :** About 90 species of scorpions are known in the Indian region. Among the more common species are *Buthus tamulus* (Fabr.) (all-India), those of the genera *Palamnaeus* (*P. bengalensis* (C. Koch) North India, eastward to Assam) and *Scorpio*.

**Araneae (spiders) :** A large order with about 16 families and 250 species from our region. All spiders are carnivorous, and most of them spin webs.

**Acarina (ticks and mites) :** Members of this group include the ticks (larger specimens) and mites (of minute size), many of which, at some stage or other in their life history, are ectoparasites of both vertebrates and invertebrates.

Two families of ticks, the Argasidae and the Ixodidae, with about 11 genera and 41 species, occur in India. They are ectoparasites of mammals (including man), birds and reptiles. Some species are believed to transmit diseases.

Mites are both terrestrial and aquatic. Many species (e.g., those of the family Trombiculidae) are parasitic on vertebrates and serve as vectors of human diseases such as tsutsugamushi disease (scrub typhus). The species *Trombicula deliensis* Walch is common in India; its larvae parasitize rodents, shrews and other mammals. Over 50 species of Trombiculids are known from our region. Little is known about our water mites, although there is no doubt that the fauna is rich.

**C1.4. Crustacea (crabs, prawns, lobsters, barnacles, wood-lice, etc.) :** The Crustacea are mostly aquatic animals varying in size from microscopic forms (e.g., *Cyclops* and *Daphnia*) to large crabs and lobsters about half a metre in length. Five subclasses, 20 orders and over 1,000 species are represented in the Indian region.

**Subcl. (i) Branchiopoda (shrimps) :** Without a well developed carapace over body. Four families occur in India. A common form is *Artemia salina* (Linn.) found in saline waters.

**Subcl. (ii) Ostracoda :** Small (1-2 mm. long) forms occurring in fresh water as well as sea-water. Two orders are found in India.

**Subcl. (iii) Copepoda :** Both are free-living and marine parasitic forms. Two orders occur in India: Eucopepoda (free-living), the common genera being *Cyclops* and *Calanus*, and Branchiura (mostly parasitic, causing considerable harm to fishes), with *Argulus* as one of our most common genus.

*Subcl. (iv) Cirripedia* : Sessile in the adult stage. Two orders occur : Thoracica includes the common foulers (*Balanus*, *Lepas*) which attach themselves to the bottoms of ships and harbour installations; and Rhizocephala (e.g., *Sacculina*), which attach themselves to the abdomen of marine crabs and undergo extreme degeneration.

*Subcl. (v) Malacostraca* (isopods, prawns, crabs, lobsters) : A large group which includes 10 orders in India and are an important source of food. The large order Isopoda includes the wood-borers which do considerable damage to harbour installations and boats. Some forms (*Nicholsia* sp.) live in deep wells. Amphipoda is also a large order, with 42 families in India, and some of them include harmful wood-borers. Decapoda has 60 families in India and includes the edible prawns, crabs and lobsters. Stomatopoda is a small marine order, with *Squilla* as the common genus.

*C1.5. Diplopoda* (millipedes) : Nearly 20 families, 90 genera and 300 species of millipedes occur in the Indian region. They are segmented, cylindrical animals, with a pair of legs in each segment. They inhabit moist soil under stones and logs.

*C1.6. Chilopoda* (centipedes) : Somewhat similar to the Diplopoda, but with a flattened body and fewer body-segments. One of our most common genus is *Scolopendra*.

*C1.7. Insecta* (insects) : They are small, segmented, six-legged invertebrates, whose body is covered with hard, cuticular shields and they usually possess two pairs of wings for flight. They occur in all situations, but are mostly terrestrial; many forms also occur in fresh water and only a few on the sea-shore. This is the largest group among animals, and nearly 50,000 species are known in the Indian region alone. Many species are harmful pests of agriculture and are carriers of human and animal diseases. A few species, like the honey-bees, lac insects and silk-worms, are useful in human economy. The class is divisible into 29 orders all of which, with one exception (Grylloblattoidea), occur in India. The more important orders are dealt with below :

**The Apterygote orders:** Four small orders are primitively wingless. Among these are the Thysanura (*Lepisma*—silver-fish), and the Collembola (spring-tails).

**Ephemeroptera** (may-flies) : Small delicate insects. They breed in fresh water.

**Odonata** (dragon-flies and damsel-flies) : Large, powerful insects with two pairs of long, transparent wings. They are carnivorous and breed in fresh water.

**Orthoptera (*sensu stricto*)**: It includes the families Tettigonidae (long-horned grasshoppers), the Gryllidae (crickets) and the Acrididae (short-horned grasshoppers). The last family includes locusts of which the most destructive species in India is the Desert Locust, *Schistocerca gregaria* (Forsk.) which swarms in cycles, the swarming periods (several years) alternating with similar non-swarming periods.

**Phasmida** (stick insects) : Long-bodied, ungainly insects which often simulate dried twigs in colour, body-shape and position of rest.

**Dermoptera** (earwigs) : A small order of insects characterized by the possession of a pair of powerful forceps at the hind end of the body. Many species show maternal care of the eggs and the young.

**Dictyoptera** (cockroaches and mantises) : It includes two families. The Blattidae includes the cockroaches. Two introduced species occur commonly in our houses—a large one, *Periplaneta americana* (Linn.), and a small one, *Blatella germanica* (Linn.). The Mantidae includes several species of praying mantises.

**Isoptera** (termites) : Nearly 200 species have been found in the Indian region and about 2,000 in the world. They are social insects, with various castes, e.g., workers, soldiers and reproductives (male and female or king and queen), and division of labour. A few species build large earthen mounds which go up to 2-3 metres in height. The common mound-building species in North India is *Odontotermes obesus* (Rambur) and in South India, *O. redemannii* (Wasm.).

**Mallophaga** (biting lice or bird lice) : Wingless, they are external parasites of birds and mammals.

**Siphunculata (Anoplura)** (sucking lice) : Wingless. Are external blood-sucking parasites of mammals. One species, with two forms, commonly occur on man—the Head Louse, *Pediculus humanus capitis* de Geer, and the Body Louse, *P. h. corporis* de Geer. *P. humanus* is responsible for the transmission of several serious diseases—endemic typhus, trench fever, murine typhus and a form of relapsing fever.

**Hemiptera** (bugs, plant-lice and scale-insects) : A large order characterized by sucking mouth-parts. They mostly suck plant-juices (plant-lice or aphids, and scale-insects or coccids), but some are blood-suckers (e.g., the Indian

bedbug, *Cimex rotundatus* Sign.). The lac insect of India, *Laccifer (Tachardia) lacca* (Kerr), whose female secretes the lac, also belongs to this order.

**Thysanoptera (thrips):** Small sucking insects which do considerable damage to the host-plant. Some species transmit virus diseases of plants.

**Neuroptera (alder-flies, lace-wings and ant-lions):** A moderate-sized order of usually harmless insects. The larvae of the family Chrysopidae are the familiar ant-lions.

**Diptera (flies, mosquitoes, gnats):** A large order which has the hind pair of wings reduced and modified into "halteres". It includes many species of great economic importance, as they are carriers of many serious diseases of man and domesticated animals, such as malaria, yellow fever and kala-azar.

**Lepidoptera (butterflies and moths):** A large order of often brilliantly coloured insects, the colour being due mainly to the presence of a large number of scales of various colours and patterns on the wings. The butterflies are often brilliantly coloured, day-flying insects which fold the wings when at rest. Moths, which form the bulk of the order, are usually drab-coloured, nocturnal insects which keep their wings spread as they take rest. The moth group contains several serious pests of agriculture.

**Siphonaptera (Aphaniptera) (fleas):** A small order of small, wingless insects which are external parasites on warm-blooded vertebrates (birds and mammals). Some of the species transmit serious diseases of human beings. The species which transmits bubonic plague in India is *Xenopsylla cheopis* (Rothschild); it is an ectoparasite on the common rats, *Rattus rattus* and a number of other rodents.

**Hymenoptera (bees, wasps, ants and ichneumons) :** A large order which contains a number of families (Apidae or bees and Formicidae or ants) which show a highly developed social life and stratification into castes (cf., Isoptera above). The common honey bees of India are : the common species *Apis indica* Fabr., a smaller, less common species *Apis florea* Fabr., and a third one (of the submontane regions), the rock bee, *Apis dorsata* Fabr. The large black ant, common in houses in North India, is *Camponotus compressus* Fabr. The large (winged individuals about 2 cm. long) Doryline ant whose bite is very painful is *Dorylus* sp.

Coleoptera (true beetles) : This is by far the largest order among insects. Many species are serious pests of our forest trees, agricultural crops and stored grain.

#### (x) PHYLUM MOLLUSCA

(Slugs, univalves, bivalves, oysters, cuttle-fish and squids)

This is a large phylum, next in size only to the Insecta, and contains about 11,000 species from the Indian region. It is divided into six classes, all of which are represented in India. Some species are economically important—their shells are used for making buttons; the pearl oyster produces the pearl of commerce; and some species are wood-borers and foulers and do serious damage to harbour installations and the bottoms of boats and ships.

*Cl.1. Chitonida* (Chitons) : A small class with four Indian families.

*Cl. 2. Gastropoda* (apple snail, pagoda snail, etc.) : A large class with 9 Indian orders and nearly 117 families. Among the common species the following may be mentioned: *Trochus niloticus* Linn. (Indian Ocean), a species commercially important for its shell; *Pila globosa* (Swain.), the large apple snail common in Indian fresh water; and *Lymnaea* and *Indoplanorbis*, common throughout India.

*Cl.3. Scaphopoda* : A small class with 2 Indian families. *Dentalium magnificum* Smith is common in the Indian seas.

*Cl.4. Bivalvia* (Pelecypoda) (Bivalves) : A large order with 55 Indian families. The common species are: *Mytilus viridis* Linn. (South India and the Andamans), *Lamellidens marginalis* (Lea) and species of the genera *Corbicula* and *Martesia* (common throughout India). The Indian pearl oyster, which is the source of our pearl fishery in the Gulf of Manaar, is *Pteria vulgaris* (Schumach.).

*Cl.5. Pteropoda* : A small class, with 5 families in India.

*Cl.6. Cephalopoda* (cuttle-fish and octopuses) : A moderate-sized order of marine molluscs, with 19 families in India. The genera commonly met with are: *Nautilus* (pearly nautilus), *Loligo*, *Sepiella* (cuttle-fish) and *Octopus* (octopuses).

#### (xi) PHYLUM ECHINODERMATA

(Sea-lilies, sea-cucumbers, star-fishes, sea-urchins and brittle-stars)

Echinoderms are marine, radially-symmetrical animals and are common in our seas, about 500 species having been found. The

living Echinoderms are divisible into 5 classes, all of which occur in our region.

*Cl.1. Crinoidea* (sea-lilies and feather-stars) : Among the common shallow-water species is *Tropiometra* sp.; among the deep-sea forms (250-5,000 metres) are *Comastrocrinus springeri* (Clark) of the seas around the Andaman Islands and *Bathyocrinus paradoxus* (Clark) of the Bay of Bengal.

*Cl.2. Holothuroidea* (sea-cucumbers) : They are cucumber-shaped animals. The body-wall of some species contains poisons which are used for catching fish. The species *Holothuria atra* Jäger, *H. scabra*, Jäger and *Stichopus chloronotus* Brdt. are common in the Palk Strait, South India and are edible, being made into a soup.

*Cl.3. Asteroidea* (star-fishes) : Some of the common star-fishes of the Indian waters are : *Astropecten indicus* Döder., *Luidia maculata* Müll. & Trosch. and *Oreaster lincki* Lütken.

*Cl.4. Echinoidea* (sea-urchins) : They have a semi-round body, covered with spines of various shapes and sizes. Among our common species are *Salmacis bicolor* Agassiz, *Temnopleurus torenumaticus* (Klein), *Lovenia elongata* (Gray) and *Laganum decagonale* (de Blain.).

*Cl.5. Ophiuroidea* (brittle-stars) : They are small but relatively active Echinoderms. Among the species commonly found in Indian waters are *Ophiocoma scolopendrina* Agsz., *Ophiothela danae* Ver., and *Garganocephalus levigatus* Koch.

#### Division B : THE CHORDATA (Vertebrata partim)

##### (xii) PHYLUM CHORDATA

The Chordata are united by a few but important common characters either throughout life or in some portion of the life-cycle. They are conveniently divided into five subphyla as follows :

1. Hemichorda (acorn worms).
2. Urochorda (Tunicata) (ascidians).
3. Acrania (lancelets).
4. Agnatha (cyclostomes).
5. Gnathostomata (fishes, amphibia, reptiles, birds and mammals). } Vertebrata

The last two subphyla together constitute what are commonly known as vertebrates. Among these, the Gnathostomata are the

animals with which we are most familiar. The bulk of our space will be devoted to this group.

*Subphylum (i) Hemichorda* (acorn worms) :

They are marine, worm-like creatures without legs, but the body surface is uniformly ciliated ; the length varies from about 2-250 cm. A few species have been recorded from Indian waters, such as *Saccoglossus bournei* (Menon), *S. madrasensis* Rao and *Glossobalanus minutus*, from the Madras coast and the Gulf of Manaar, and *Glossobalanus* sp. and *Balanoglossus* sp. from Port Okha. The genus *Cephalodiscus* also is known from the Indian Ocean.

*Subphylum (ii) Urochorda* (Tunicata) (ascidians or sea-squirts) :

Several orders and families of these forms, some sessile, others pelagic, occur in our seas. Among the sessile ones are the ascidians, the most common Indian forms being members of the genus *Herdmania* of which 4 species are known from our seas—*H. pallida* (Hell.), *ceylonica* (Herdm.), *mauritiana* (v. Dr.) and *ennurensis* (Das). Other sessile genera are *Ascidia*, *Clavellina* and *Botryllus*. Among the pelagic genera of our seas may be mentioned *Pyrosoma* (which emits a phosphorescent light) and *Salpa*.

*Subphylum (iii) Acrania* (lancelets) :

The lancelets are small, semi-transparent, lancet-like marine creatures found burrowing in sand near the shore in warm and temperate seas. Two genera, each with several species, *Branchiostoma* (including subgenus *Amphioxus*) and *Asymetron*, occur in Indian seas. The well known European species *Branchiostoma* (*Amphioxus lanceolatus*) has recently been recorded from the Arabian Sea.

*Subphylum (iv) Agnatha* (lampreys and hag-fishes) :

They have been found in the seas of Europe, North America, Chile, Japan, West and South Africa, Australia and New Zealand, but have not been recorded from the Indian seas. Some species also occur in fresh water.

*Subphylum (v) Gnathostomata* (chordates with a pair of jaws) :

This subphylum contains all the remaining vertebrates in addition to the Agnatha mentioned above. Five classes of the living forms are customarily recognized, namely, the Pisces (fishes), Amphibia (frogs, salamanders, etc.), Reptilia (reptiles), Aves (birds) and Mammalia (mammals). But Pisces is now elevated to

a superclass or "series", with 7 classes of which only 4 are living.

*Cf.* 1. *Pisces* (fishes):—The living fish fauna of the Indian region belongs to three subclasses :

Subcl. 1. *Elasmobranchii*. (cartilaginous fishes—sharks, skates and rays.)

Subcl. 2. *Holocephali* (chimaeras).

Subcl. 3. *Teleostomi* (true bony fishes).

The *Elasmobranchii* is represented by 5 orders and 16 families; the *Holocephali* by one order and 2 families; and the *Teleostomi* by 34 orders and 183 families. The *Elasmobranchii* and the *Holocephali* are entirely marine, though a few species of the former, such as *Dasyatis (Pastinachus) sephen* (Forsk.) and *Pristis microdon* Lath. ascend freshwaters. The *Teleostomi* are both freshwater and marine. The lung-fishes (class *Dipnoi*) are totally absent in the Indian region.

In 1889, Day recorded 1,418 species of Indian fishes. Since then, many new species have been discovered and today the number is about 1,650. Of these about 348 (21 per cent) are mainly freshwater, and the remaining 1,302 (79 per cent) marine. Among the marine fishes, about 174 (10 per cent of the total) are deep-sea forms.

Fishes are to be found in a wide variety of aquatic habitats—deep and shallow seas; all along the coasts of India, whether rocky, sandy or muddy; in lagoons, backwaters and estuaries; among coral reefs, in lakes, ponds, wells, rivers and mountain torrents. The torrential fishes possess special adaptation, such as suckers, for holding fast to the substratum. The freshwater fish fauna has elements common with the Indo-Malayan and Indo-Chinese regions. The African element is poor but not wanting, for the Cichlids, *E troplus* spp., are common in South India and Ceylon. The marine forms have a wide distribution and several genera are common to the Indo-Pacific and the Atlantic regions. The distribution of the Indian *Elasmobranchii* and *Holocephali*, which are marine, seems to be governed by mean annual isotherms.

Certain fishes are migratory, spending their life in sea and in fresh water alternately. Species which migrate from sea to fresh water for breeding purposes are called *anadromous* fishes, e.g., *Hilsa ilisha* (Ham.), the Indian shad. Species migrating in the reverse direction for breeding are called *cataudromous* fishes, e.g., the eel, *Anguilla bengalensis* (Gray & Hardw.).

A short account of the various classes of fishes follows :

*Elasmobranchii* (cartilaginous fishes) : It includes the sharks, skates and rays. They are common in the Indian seas and estuaries. The five orders are: Hexanchiformes, Lamniformes (*Scyliorhinus*),

Squaliformes (*Centrophorus*, etc.), Rajiformes (*Raja*) and Torpediniformes (*Torpedo*, etc.). The large and dreaded gray sharks and tiger sharks (*Carcharhinus* and *Galeocerdo*), the hammer-headed sharks (*Sphyrna*), the saw-fishes (*Pristis*), the sting-rays (*Dasyatis*) which have a spiny whip-like tail, the large eagle-rays or devil-fish (*Myliobatis*), the torpedos and electric-rays (*Torpedo*, *Narcine* and *Bengalichthys*), are common on the Indian coasts as well as in the seas around the Andaman and Nicobar Islands. Some of the sharks, *Carcharhinus gangeticus* (Müll. & Henle), skates, *Pristis microdon* Latham, and rays, *Dasyatis sephen* (Forsk.), ascend larger rivers hundreds of kilometres above the tidal limits. Some classes of people on the Indian coast eat the flesh of sharks and rays, while their dried fins are exported. Some of the sharks, especially *Carcharhinus limbatus* (Müll. & Henle), *C. melanopterus* (Quoy & Gaim.), *Sphyrna blochii* (Cuv.), *S. zygaena* (Linn.) and *Pristis microdon* Lath., are used for extracting "shark-liver oil" for medicinal purposes (particularly as a concentrated source of vitamins A and D); it is said to be superior to the imported cod-liver oil and has replaced the latter.

Holocephali: The chimaeras are poorly represented. A single order, Chimaeriformes, contains two deep-sea species : *Chimaera monstrosa* Linn. and *Hariotta indica* (Garman) (egg-capsules only).

Teleostomi: The true bony fishes comprise the bulk of the fish fauna of India. Thirty-four orders and 183 families are recognized, all belonging to the subclass Actinopterygii ; the other subclass, Crossopterygii (the Coelacanths, *Latimeria Chalumnae* Smith), is wanting in the Indian region. The more prominent Actinopterygii are mentioned below.

The eels (order Anguilliformes) occur in both marine and freshwater environments and comprise 12 families. Those inhabiting coral reefs or rocky shores have prominent bands and spots. The best known eel genera are *Anguilla* and *Muraena*. The so-called spiny-eels, *Mastacembelus* spp. (Mastacembelidae), are not true eels and belong to the order Mastacembeliformes.

The order Cypriniformes includes the cat-fishes (suborder Siluroidei) and the carps (suborder Cyprinoidei). The cat-fishes, which are scaleless and have well developed feeler-like barbels, mostly inhabit rivers and their estuaries as well as hill-streams. Some of them, such as *Wallago attu* (Bloch. & Schn.), attain a large size (nearly 2 metres in length) and are sometimes called "freshwater sharks". A few Siluroid genera, such as *Tachysurus*, *Arius* and *Osteogeniosus*, are marine. The carps live exclusively in fresh waters and include some of our most important food-fishes, such as the bola, *Barilus bola* (Ham.) the mahseers, *Tor tor* (Ham.)

and other species, the catla, *Catla catla* (Ham.), the mrigal, *Cirrhinus mrigala* (Ham.), the rohu, *Labeo rohita* (Ham.) and the kalbasu, *Labeo calbasu* (Ham.).

The Perciformes is a large order containing nearly 75 families in India and includes the perches, sea bass, groupers and snappers, with many marine genera and a few freshwater ones (e.g., *Ambassis*, *Nandus*, *Badis*, etc.). Many perches are edible, the better known being the bhekti, *Lates calcarifer* (Bloch.), the snappers, *Lutjanus malabaricus* (Bloch. & Sch.) and *L. argenteimaculatus* (Forsk.), the rock perches, *Epinephelus maculatus* (Bl.) and *E. Tauvina* (Forsk.) and the pink perches, *Nemipterus bleekeri* (Day) and *N. japonicus* (Bl.).

The cods and haddocks (Gadidae) are poorly represented. The soles (Soleidae) are represented by several species of flat-fishes of the genera *Solea*, *Brachirus*, etc. Common along our coasts are the globe-fishes (Tetraodontidae), the pipe-fishes (Syngnathidae) and the sea-horses (Hippocampidae).

Among the Clupeiformes, the family Clupeidae includes the sardines (*Sardinella* spp.), the Indian herrings such as the popular food-fish hilsa, *Hilsa ilisha* (Ham.) and kannan, *Ilisha indica* (Swn.); the family Synnodidae includes the Bombay duck, *Harpodon nehereus* (Ham.); and the family Salmonidae includes a few species of salmons, *Salmo trutta fario* Linn. etc., all of which are introduced species—there are no true salmon and trout indigenous to India.

*Food-fishes*: The common food-fishes are marine, brackish-water and freshwater inhabitants, and belong mainly to the following orders :

Elasmobranchii : Orders Lamniformes (sharks, dog-fishes) and Rajiformes (skates and rays).

Teleostomi: Orders Clupeiformes (sardines, feather-backs, tarpons), Cypriniformes (carps, minnows, cat-fishes), Beloniformes (needle-fishes, half-beaks), Mugiliformes (mullets, barracudas), Perciformes (perches, mackerels, horse mackerels, hair-tails, sail-fishes, spear-fishes, etc.), Pleuronectiformes (soles, tongue-fishes), Ophiocephaliformes (snake-heads, murrels), Polynemiformes (threadfins), Thunniformes (tunneys, bonitos) and Mastacembeliformes (spiny-eels).

Cl 2. Amphibia (caecilians, frogs, toads, salamanders):—The Amphibia are cold-blooded vertebrates having a smooth or rough skin rich in glands which keep it moist; scales are generally absent and, if present, they are hidden in the skin. They are a transitional group which lead a dual life (Greek: *amphi*, dual, and *bios*, life). They are neither fully aquatic nor fully terrestrial but have compromised, with the result that they are not particularly

well adapted to either environment. The living forms are divided into three orders, all of which are found in India :

Order Apoda (or Gymnophiona) (The limbless caecilians or blindworms).

Order Caudata (or Urodela) (salamanders and newts).

Order Ecaudata (or Anura) (frogs and toads).

In 1890, Boulenger had listed 130 species in the Indian region. Several new species have since been discovered, and about 250 are now known.

(i) Apoda (Gymnophiona): The caecilians or blindworms (family Caeciliidae) have a slender worm-like body without limbs and girdles, and the tail is either rudimentary or absent. Only 4 genera (*Ichthyophis*, *Uraeotyphlus*, *Herpele*, and *Gegenophis*) and 8 species occur in India. Three genera are found in the Western Ghāts of South India and one in Assam (*Herpele*).

*Ichthyophis glutinosus* (Linn.), is an interesting species, which occurs in Malabār, Eastern Himālayas and Assam, and also in Ceylon, Burma, Thailand and Indonesia. About 40 cm. long and 1·5 cm. in diameter, it is found in soft mud and other damp habitats. The female protects the eggs by coiling herself round the egg-mass.

(ii) Caudata (Urodela): This order includes the newts and salamanders which are characterized by the possession of a tail in adult life. Out of about 150 world species, only one, the Burmese newt, *Tylototriton verrucosus* Anderson (family Salamandridae) is found in the Indian region. Its range is: Eastern Himālayas (Sikkim and Darjeeling), North Burma (Kakhya hills) and Yunnan. It is about 15 cm. in length of which the tail makes up one-half; there is a well marked head and two pairs of well developed limbs. It lives on land except in the breeding season when it takes to the water.

(iii) Ecaudata (Anura): Frogs and toads form the most numerous component of our Amphibian fauna, and comprise six families, viz., the Ranidae, Polypedatidae, Microhylidae, Bufonidae, Hylidae and Pelobatidae.

Ranidae: Some of the most common frogs belong to the largest family, Ranidae, e.g., the bull frog, *Rana tigrina* (Daudin), the water-skipping frog, *R. cyanophlyctis* Schneider and the burrowing frog, *R. breviceps* Schneider. Their tadpoles are variously adapted to lead a life in ponds, streams and torrents. *Staurois afghanus* (Günther), a form occurring in torrential

streams of the Himālayas, has a tadpole which possesses a ventral suctorial disc to be able to adhere to the rocky stones against the force of the current. *Nannabatrachus beddomii* Boul. is the smallest Amphibian known (length c. 20 mm.) and occurs in the Tirunelveli hills (South India).

**Polypedatidae:** The family is represented in India by the genera *Rhacophorus* and *Philautus*, and includes the tree-frogs. *Rhacophorus maculatus* (Gray), the chunam frog of Madras, is a medium-sized species (length c. 8 cm.) which climbs trees and also frequents houses. In *R. reticulatus* (Günth.) of Ceylon, the female carries its eggs in shallow pits in the skin of the abdomen. The genus *Philautus* is represented by over a dozen species found in Peninsular India, Ceylon and Burma. *P. variabilis* (Günth.) is the common form in Malabār, the Nilgiris and Wynnaad.

**Microhylidae:** Members of this family are characterized by the absence of teeth in both jaws, and include terrestrial, aquatic and burrowing, but not arboreal, forms. The fat-frog, *Uperodon systoma* (Schneider) is the burrowing form sometimes found in nests of ants and termites in South India. *Microhyla rubra* (Jerdon) is common in Assam, South India and Ceylon.

**Bufonidae :** This family includes the true toads which are characterized by toothless jaws and diapophyses of the sacral vertebrae dilated. It is represented in India by 3 genera: *Bufo*, *Nectophryne* and *Cophophryne*. The commonest Indian toad, *Bufo melanostictus* Schn., is a large species (length about 17 cm.), ranging from all-India and Ceylon to Malaya and South China. *B. andersonii* Boulenger is a small toad (length about 8 cm.) found in the arid zone from Western Uttar Pradesh, via Rājasthān and Sind to South Arabia.

**Hylidae :** This family is represented by a single species *Hyla annectens* (Jerdon), found in Assam and Upper Burma.

**Pelobatidae :** This family is represented by a single genus, *Megalophrys* (formerly *Leptobrachium*), with four species ranging from Sikkim to Upper Burma, South China, Malaya and Indonesia. *M. monticola* (Günth.) is fairly common in Northern Bengal (Darjeeling), Sikkim and Assam and is also found in Upper Burma and probably also in South China. Its tadpoles have a funnel-shaped mouth which seems to be peculiar to this genus.

*Cl. 3. Reptilia* (reptiles : crocodiles, turtles, tortoises, lizards, and snakes) :—*Reptilia* are cold-blooded vertebrates breathing throughout their lives by means of lungs; the body is covered with scales. The group arose from the *Amphibians* and reached its maximum development in the Mesozoic period several million years ago when they were the dominant creatures on earth. Then they declined. Out of about 19 orders into which the *Reptilia* are generally divided, only 4 survive today; the others are known only from fossils. Of the four living orders, one viz., *Rhynchocephalia*, with a single species *Sphenodon punctatus* is confined to New Zealand ; the remaining three are more widely spread and their representatives also occur in India.

1. *Loricata* (or *Crocodilia*) : Includes the crocodiles, gharials, alligators and caimans.
2. *Testudines* : Includes the chelonians (tortoises, turtles and terrapins).
3. *Squamata* : Includes the lizards and snakes.

(i) *Loricata* (*Crocodilia*) : This order includes the crocodiles and the gharial. Only three species occur in India. The gharial, with an elongated snout, belongs to the genus *Gavialis*; the other two with broad snouts belong to the genus *Crocodilus*. Alligators do not occur in India.

The gharial, *Gavialis gangeticus* (Gmelin), is a large crocodile which is found in a few rivers and their tributaries—the Indus, Ganga, Mahānadi, Brahmaputra and Kaladan (Arakan, Burma). Probably it also occurs in the Chilka lake in Orissa. It grows to a length of up to 6·5 metres, males being larger than females. Its food mainly consists of fish and birds. Eggs, about 40 or more, are deposited in sand and hatched in March-April.

The marsh crocodile, *Crocodilus palustris* Lesson, is widely spread, occurring from Baluchistān (West Pākistān) in the west to the whole of India, Nepāl, and Ceylon; its occurrence in Burma is doubtful. It is a freshwater crocodile, inhabiting swamps, tanks, lakes and rivers, and grows up to about 4 metres in length. Its food is mainly fish and birds and it may occasionally attack man. Eggs, about 20 or more, are laid in holes in sand in the beginning of the monsoon, and hatch in about 40 days. In some places, it is kept in semi-captivity; in Manga Pir, about 15 km. from Karāchi, a few hundred crocodiles are kept in a tank by a religious hermit and his followers.

The coast or estuarine crocodile, *Crocodilus porosus* Schneider, inhabits the mouths of rivers and canals near the sea, and can swim several kilometres into the open sea ; the muddy deltaic regions are specially suited to it. It is widely distributed from India,

Ceylon and Burma to Malaya, Indo-China, the Philippines, the Solomon and Fiji Islands and the northern coast of Australia. In India it occurs all along the East Coast down to the tip of the Peninsula and up the West Coast as far north as Cochin. It is the largest living reptile known, and reaches a maximum length of c. 10 m. It eats fish, birds and crabs. Some become man-eaters. About 50-60 eggs are laid in crude nests made with leaves and reeds.

The number of crocodiles has been greatly reduced by hunting. All the three species are now protected in India and skins are not allowed to be exported.

(ii) Testudines (Chelonia): This order includes the turtles, tortoises and terrapins, and about 50 species belonging to several genera are known from the Indian region. The leathery turtle or luth, *Dermochelys coriacea* (Linn.) is the largest of all the chelonians, and grows up to over 2 m. in length and about 450 kg. in weight. It is widely distributed in the Tropics but is rare everywhere. It occurs in our region only on the coasts of Ceylon and Kerala. The green or edible turtle, *Chelonia mydas* (Linn.), is common around the Andaman Islands. The hawksbill turtle, *Eretmochelys imbricata* (Linn.), is fairly common on the Indian and Indo-Chinese coasts, and in other tropical and subtropical seas. It provides the "tortoise shell" of commerce. The fresh-water tortoises (family Emydidae) are represented in India by about 33 species and 15 genera. Of these, the common three-keeled land terrapin, *Geoemyda trijuga* (Schweigger), is widely distributed all over India, Ceylon and Burma, *Geoclemys hamiltoni* (Gray) occurs in Northern India, *Hardella thurgi* (Gray) lives in the Ganga and the Brahmaputra rivers and *Kachuga tectum* (Gray) in the Indus, Ganga and Brahmaputra rivers and their tributaries. The land tortoises (family Testudinidae) belong to the genus *Testudo*, the common species being the starred tortoise, *T. elegans* Schoepff. found in Rājasthān, Central and Southern India and in Ceylon; in Ceylon it occurs in forests and in dry areas—*T. emys* Schleg. & Müll. occurs from Assam to Burma, Thailand and Malaya and is the largest Asiatic species of *Testudo*. The common freshwater and mud turtles (family Trionychidae) are : *Lissemys punctata* (Bonn.) (the Indus and the Ganga and their tributaries), *Chitra indica* (Gray) (North India, Thailand and Malaya) and *Trionyx gangeticus* Cuvier, *T. leithi* Gray and *T. hurum* Gray (river systems of North India).

(iii) Squamata (lizards and snakes): This order includes two suborders—the Sauria (geckos, chameleons, skinks and monitor lizards) and the Serpentes (snakes).

(a) *Sauria* (lizards): Nearly 250 species of *Sauria* are found in Indian limits. The geckos occur everywhere except at high altitudes and in thick forests. The commonest species belong to the genera *Gymnodactylus*, *Cnemaspis* (hilly areas of South India and Ceylon) and *Hemidactylus*. The commonest house-gecko in India and Ceylon is *Hemidactylus brooki* Gray., *H. flaviviridis* Rüppell is the common North Indian lizard. *Ptychozoon kuhli* Stej. is the parachuting lizard of the Nicobar Islands; it is said to parachute from tree top to tree top. Among the ground and flying lizards (family Agamidae) may be mentioned the flying lizards (genus *Draco*) of South India and Assam. The spiny-tailed lizard, *Uromastix hardwickii* Gray, occurs throughout North-west India, as far east as Uttar Pradesh. It also occurs in Sind (West Pākistān). Of the so-called "blood-suckers" (*Calotes* spp.), *C. versicolor* (Daudin) is the common species found in gardens and open jungles all over India, Ceylon, Afghānistān, Indo-China and South China. Since members of the genus *Calotes* change colour, they are often erroneously called chameleons. The true chameleon (family Chamaelionidae) is represented hereby a single species, *Chamaeleon zeylanicus* Laurenti, found in Southern India and Ceylon.

The skinks (family Scincidae) are represented by several species which live in a variety of habitats. The commonest species are *Mabuya carinata* (Schneider) of Central and Peninsular India, *M. beddomii* (Jerdon) of South India and *M. dissimilis* of North India and West Pākistān.

The monitor lizards (family Varanidae) are represented in India by four species of the genus *Varanus*, namely: the yellow monitor, *V. flavescens* (Gray) of North India and West Bengal; the desert monitor, *V. griseus* (Daudin), of North and North-west India and West Pākistān and further west to North Africa; the common monitor, *V. monitor* (Linn.) found throughout India, Burma and Ceylon and the water monitor, *V. salvator* (Laurenti) ranging from India, Ceylon, South East Asia upto North Australia. Several hundred thousand skins, valued at several lakhs of rupees, of these monitors are exported annually from India. In the year 1957-58 about 1,625,021 skins, valued at Rs. 31,66,039, were exported. The skins of *V. salvator* are rare and their export is prohibited.

(b) *Serpentes (Ophidia)* (snakes) : Nearly 400 species of snakes occur in the Indian region. Of these about one-fifth are poisonous, and snake-bites annually claim nearly 20,000 to 30,000 human victims, in addition to a large number of cattle.

Among the common snakes of India are the rat-snake or *dhaman*, *Ptyas mucosus* (Linn.) and the common wolf-snake, *Lycodon aulicus* (Linn.). Of the harmless grass-snakes or striped keelbacks, *Natrix* spp., several species occur, the common ones being *N. piscator* (Schneider) and *N. stolata* (Linn.). The sea-snakes (family Hydrophiidae), all of which are very poisonous, are represented by nearly 25 species. Among the species more widely distributed on our coasts are: *Pelamis platurus* (Linn.), the most widely distributed of all sea-snakes, extending from Siberia to Tasmania and the common species of the Indo-Australian seas, and *Enhydrina schistosa* (Daudin), the commonest snake on our coasts.

Among the more deadly land snakes, the kraits and cobras (family Elapidae) may be mentioned. The kraits (genus *Bungarus*) are represented by eleven species. The common Indian krait, *B. caeruleus* (Schneider), occurs throughout North India down to about latitude 18°N. and in Ceylon (rare). Two species of cobras occur, viz., Indian cobra, *Naja naja* (Linn.) and king cobra or Hamadryad, *N. hannah* (Cantor), which grows up to about 4-5 metres (c. 15-18 feet) in length. The vipers (family Viperidae) are represented by over 20 species. The common ones are: Russel's viper, *Vipera russellii* (Shaw), saw-scaled viper, *Echis carinatus* (Schneider) and pit vipers (genus *Trimeresurus*).

Other snakes deserving mention are the worm-snakes, blind snakes [*Typhlops braminus* (Daudin) and other species], the huge pythons (family Boidae), the commonest being the Indian python, *Python molurus* (Linn.), and the sand boa, *Eryx johni* (Russell).

*Cf.* 4. Aves (birds) : As might be expected from the diversity that obtains in the different parts of the Indian subcontinent as regards physiography and ecological conditions, the avifauna is remarkably rich in variety and numbers. The latest comprehensive list, *A Synopsis of the Birds of India and Pakistan* (together with those of Nepal, Sikkim, Bhutan and Ceylon) by S. Dillon Ripley, enumerates 1,200 species which is about 14% of the world total.

of 8,600. Together with their subspecies, or geographical races, the total of Indian forms reaches 2,061, and includes land birds as well as pelagic families such as petrels and shearwaters, normally found only at sea but which are sporadically blown on to our seaboard by heavy monsoon gales. Of this number some 1,750 forms are resident within our boundaries, the rest being migratory. The latter breed outside our territory, mostly in the Palaearctic region, beyond the Himalayas—in Central and Northern Asia, and Eastern and Northern Europe. The migratory forms are found in India only during the winter months; they arrive in autumn, mainly between September and November, and leave for their northern breeding grounds before our hot weather commences, in March-April. Among them are regular winter visitors, both common and rare, and casual vagrants as well as accidental strays.

An analysis of the 180 odd species purely endemic to India shows that the greatest affinity of our avifauna is with the Indo-Chinese subregion, no less than 63% of the endemics belonging to that category. About 17% show Palaearctic affinities, and 16% Ethiopian. The remaining 4% or so are either relict species or of uncertain affinities.

Of the 28 Natural Orders into which the living birds of the world are divided, 20 are represented in the Indian avifauna. The orders are again broken up into lower categories, such as suborders (in some cases), families, subfamilies, genera, species and subspecies or geographical races. The 20 orders that concern us, with some of their characteristics and more prominent components, are listed in the following pages; further information may be obtained from the books mentioned at the end of this chapter.

*Order Gaviiformes* : Divers. Superficially rather duck-like, swimming water birds with the first three toes fully webbed. Bill strong, tapering, pointed. Tail short but well developed. The blackthroated diver (*Gavia arctica*) and the redthroated (*G. stellata*) have occurred as rare vagrants.

*Order Podicipediformes* : Grebes, as typified by the familiar little dabchick (*Podiceps ruficollis*) common on all village tanks and ponds. Bill sharply pointed; wings short; tail rudimentary.

*Order Procellariiformes* : Petrels and shearwaters. Pelagic in habit, normally seen from ships out at sea; occasionally blown inland by gales. Characterized chiefly by the possession of tubular nostrils.

*Order Pelecaniformes* : Tropic-birds, boobies, frigate birds, pelicans, cormorants and darters—all fish-eaters. The first three are pelagic; the others frequent inland waters—*jheels*, reservoirs tidal creeks. The spottedbilled pelican (*Pelecanus philippensis*)

breeds in Andhra Pradesh and elsewhere in Peninsular India; also cormorants of all our three species, and darters or snake-birds.

*Order Ciconiiformes* : Herons, storks, ibises, flamingos. All these families are well represented. The first three nest colonially in mixed heronries, together with cormorants and darters. The colonies are sometimes very populous and densely packed, e.g., the Keoladeo Breeding Waterbird Sanctuary at Bharatpur, Rājasthān. The water of these heronries is heavily saturated with the droppings of these fish-eating birds; through research and scientific exploitation, they could become a source of valuable fertilizer in the form of liquid guano. The Great Rann of Kutch is the only known nesting ground in India of the large flamingo (*Phoenicopterus ruber*). The concentration of breeding birds here has been estimated to be between one-half and one million. This is one of the largest breeding colonies, or "flamingo cities" in the world.

*Order Anseriformes* : Ducks, geese and swans. In this group of popular sporting birds we have 3 species of swan (*Cygnus*), 7 species of geese (*Branta*, *Anser*), and some 33 species of duck and teal. All the swans and geese, and most of the ducks are migratory, and are identical with those found in Europe. The resident species are the large and lesser whistling teals, or tree ducks (*Dendrocygna bicolor* and *D. javanica*), the spotbilled duck (*Anas poecilorhyncha*), the cotton teal (*Nettapus coromandelianus*), the nukta (*Sarkidiornis melanotos*), and the whitewing wood duck (*Cairina scutulata*). A very interesting endemic species which has become extinct during the last twenty-five years is the pinkheaded duck (*Rhodonessa caryophyllacea*) formerly found in Bihār and Assam.

*Order Falconiformes* : Birds of Prey. Represented by the families Accipitridae (hawks and vultures), Falconidae (falcons), and Pandionidae (osprey). The vultures (8 species), of which the commonest and most widespread is the whitebacked *Gyps bengalensis*, are a beneficial group of carrion feeders which render great service to man as scavengers by speedily disposing of the carcasses of domestic animals lying in the precincts of human habitations. They include the lämmergeier or bearded vulture (*Gypaëtus barbatus*) of the High Himālayas which may have a wing span of c. 335 cm. from tip to tip. The osprey (*Pandion haliaetus*), a Palaearctic migrant, is a fish hawk of almost world-wide distribution. Interesting forms among the rest are the golden eagle (*Aquila chrysætos*) found in the Himālayas, and several other eagles in the hills and plains of which perhaps the commonest and most widely ranging are the tawny eagle (*Aquila rapax*) and the crested serpent eagle (*Spilornis cheela*). Besides the vultures and true eagles, this order

includes the hawk-eagles, bazas, the goshawk, sparrow-hawks, the peregrine, luggar, and shahin falcons, the kestrel, shikra, several buzzards, harriers, and kites. Many of these are migratory. The dainty little falconets (*Microhierax*), no larger than a shrike, which prey on butterflies and large flying insects captured on the wing, inhabit the open wooded country in the Himālayan foot-hills and Assam. As a group the birds of prey have been unjustly maligned for alleged destruction of game birds and ground game. They are usually classified as vermin and afforded no legal protection. A careful study of the food and feeding habits of many species indicates, however, that by preying on rats and mice and other pests, they act as an important natural check. On balance, they are more beneficial than harmful and deserve strict protection.

*Order Galliformes:* The family that chiefly concerns us is Phasianidae, the so-called Game Birds, which includes pheasants, junglefowl and spurfowl, partridges and quails. They are all predominantly granivorous birds with strong, moderate sized bills, rounded wings, strong, short to moderately long legs (spurred in the males of many species), and stout blunt claws for scratching the ground for food. The group is typified by the red junglefowl, believed to be the ancestor of all our domestic breeds. In many species, such as pheasants and junglefowl, the sexes are differently coloured, the cock being the more showy. In others like the partridges and quails the sexes are usually alike. The peafowl (*Pavo cristatus*) is common, and has become particularly so under the semi-domesticated conditions of the strict protection it enjoys from the local population in Gujarāt, Rājasthān, and some other parts of the country. Where hunted, the bird is excessively shy and wary. The red junglefowl (*Gallus gallus*) is found in Northern and North-eastern India, its range coinciding almost exactly with that of the sal tree (*Shorea robusta*). In the forested tracts of Western and Peninsular India its place is taken by the grey junglefowl (*G. sonneratii*) whose neck feathers with their curious waxy yellow spots are much prized in the U.S.A. for the manufacture of fishing flies. Pheasants are found chiefly in the Himālayas where their hunting affords enjoyable but strenuous sport. Among the commoner species are the chir (*Catreus wallichii*), koklas (*Pucrasia macrolopha*), kalij (*Lophura leucomelana*), monal (*Lophophorus impejanus*), and four species of the tragopan or horned pheasant. The kalij is found in the foot-hills, but the rest range mainly between 1,800 and 4,200 metres elevation. There are other species of pheasants (*Polyplectron*, *Ithaginis*) and related birds such as the snowcock (*Tetraogallus*), snow partridge (*Lerwa lerwa*), and several hill partridges (*Arborophila*) and the chukor (*Alectoris*) found in the Himālayas, besides

many species of francolins (*Francolinus*) and quails (*Coturnix*, *Perdicula*) in other parts of the Peninsula. The mountain quail (*Ophrysia superciliosa*) is an enigmatical species, first described in 1846 and found again only twice or thrice thereafter at between 1,500 and 2,100 m. altitude in the Western Himālayas (Mussoorie and Naini Tāl). During the last 50 years or so, no more specimens have turned up in spite of special search by ornithologists.

*Order Gruiformes:* Represented in India by the following families : Turnicidae (button and bustard quails), Gruidae (cranes), Rallidae (rails), Heliornithidae (finfoot), and Otididae (bustards).

The button and bustard quails have barred or spotted plumage and resemble the true quails in appearance, but they possess only 3 toes like the bustards. The females are polyandrous and more brightly coloured than the males. The cranes are typified by the saras (*Grus antigone*), a large grey bird with bare crimson head and long red legs, standing as tall as a man. It is our only resident crane, commonly seen in pairs near about cultivation, particularly in Northern India. Considered sacred and, like the peafowl, protected by the people, it has become tame and confiding. Two other cranes, the common (*Grus grus*) and the demoiselle (*Anthropoides virgo*) visit India in winter in enormous flocks. They do considerable damage in newly sown wheat and gram fields. The birds are much sought after by sportsmen, since they are good for the table, and extremely wary and difficult to circumvent. The beautiful white Siberian crane (*Grus leucogeranus*) is a rare winter visitor in small numbers.

Rails are marsh-haunting birds of small to moderate size, with short tail, rounded wings, and longish bare legs and toes. The whitebreasted waterhen (*Amaurornis phoenicurus*) and moorhen (*Gallinula chloropus*), common in shrubbery-bordered tanks and ponds throughout India, are typical examples. They skulk about amongst reeds and marsh plants and seldom show themselves. Some species, e.g., coot (*Fulica atra*), have lobed toes by means of which they can swim with ease. Their flight is weak, but nevertheless they often fly long distances, some of the forms being migratory.

The masked finfoot (*Heliopais personata*) is a rare and curious species which occurs only in Assam and East Pākistān in low jungle swamps and ponds. In appearance it is between a coot and a diver with short legs, scalloped toes, and a comparatively long and heavy pointed yellow bill.

Our bustards include the Bengal florican (*Eupodotis bengalensis*) and the likh (*Sypheotides indica*), both resident species which haunt tall grassland. The houbara (*Chlamydotis undulata*) is a

migratory species that visits the semi-desert areas of Rājasthān, Gujarāt and Kutch, in winter. But our most interesting and spectacular species, and one that is faced with imminent extinction unless rigidly protected, is the resident great Indian bustard (*Choriotis nigriceps*). Like all bustards, it is often the target of poachers in spite of the official ban on its killing, and its numbers are rapidly dwindling. The increasing encroachment of its habitat under population pressure is another cause of its continuing decline.

*Order Charadriiformes:* This large and heterogeneous order contains at least 11 families, represented in India by resident as well as migratory forms. It includes the jaçanas, plovers, snipes, sandpipers, avocet, oystercatcher, gulls and terns.

Jaçanas, also known as lily-trotters, of 2 species—the pheasant-tailed (*Hydrophasianus chirurgus*) and the bronzewing (*Metopidius indicus*)—live on vegetation-covered tanks where they run about on the floating singara (*Trapa*) and lotus leaves with the aid of their enormously lengthened spidery toes.

Plovers are typified by the two common lapwings, the redwattled (*Vanellus indicus*)—the well known “Did-he-do-it” (from its calls)—and the yellowwattled (*Vanellus malabaricus*). The best known among the migratory plovers is perhaps the eastern golden plover (*Pluvialis dominica*), with spangled gold and black plumage, which keeps in flocks on moist grassy mudflats and is much prized by sportsmen. Several species of snipe and sandpipers are found in winter. Good shooting is afforded by the fantail and pintail, snipe (*Capella gallinago* and *C. stenura*), and large bags are made when the migrants first arrive, particularly in Kashmīr and Bengal. The related snipe-like waders, the greenshank (*Tringa nebularia*) and the redshanks (*Tringa totanus* and *T. erythropus*) along with numerous other species of sandpipers, godwits (*Limosa limosa* and *L. lapponica*), curlew and whimbrel (*Numenius arquata* and *N. phaeocephala*), stints, the avocet (*Recurvirostra avosetta*) and the black-winged stilt (*Himantopus himantopus*) frequent the estuaries, tidal mudflats, and backwaters along the seaboard and inland waters, in winter. The painted snipe (*Rostratula benghalensis*) is a widespread resident on marshes, while the rare ibisbill (*Ibidorhyncha struthersii*)—an aberrant sandpiper—lives at altitudes of 1,800 to 4,000 m. in the Hīmālayas on shingly river beds. The stone curlew or goggle-eyed plover (*Burhinus oedicnemus*) inhabits open, stony semi-desert areas and fallow land, sharing this biotope with the swift-footed Indian courser (*Cursorius coromandelicus*). An enigmatic relation of the last is Jerdon's, or the double-banded, courser (*Cursorius bitorquatus*), a rare, apparently resident bird

which has been completely lost since it was last seen in Andhra Pradesha in 1900. The collared and small Indian pratincoles (*Glareola pratincola* and *G. lactea*) are found on dry open pastures and shingle beds of the larger rivers in Northern and Peninsular India.

In keeping with our extensive coastline, the gulls and terns are well represented, the former by 8 species and several geographical races, and the latter by at least 20 forms. The gulls commonly seen in harbours and inshore waters are the herring and lesser black-backed gulls (*Larus argentatus* and *L. fuscus*) and the brownheaded and blackheaded species (*L. brunnicephalus* and *L. ridibundus*). All are winter visitors to our area except the brownheaded gull which breeds on upland lakes in Ladakh. Our commonest terns are the gullbilled (*Gelochelidon nilotica*) chiefly of the sea coasts, and the river tern (*Sterna aurantiaca*), the black-bellied (*S. acuticauda*) and the whiskered (*Chlidonias hybrida*) on inland waters. Most of the other terns are met with offshore, commonly following fishing boats. They include the sea terns, the large and lesser crested *Sterna bergii* and *S. bengalensis*. Many species breed within Indian limits on sandy beds of the larger rivers, vegetation covered *jheels*, and rocky offshore islets. Closely allied to the terns is the skimmer (*Rynchops albicollis*) with the peculiar laterally compressed knife-blade bill in which the lower mandible projects beyond the upper. The skimmer is not uncommon on the larger North Indian rivers where it nests on sandbanks.

*Order Columbiformes*: Represented in India by the families Pteroclidae (sandgrouse) and Columbidae (pigeons and doves). Both families include many species that are highly prized as sporting birds and for the table. Pteroclidae contains 7 species of sandgrouse (1 *Syrrhaptes*, 6 *Pterocles*). These birds inhabit open, semi-desert areas and fallow cultivation in large flocks, and have the well known habit of resorting to favourite drinking places at fixed hours. Most of the species are migratory. The one most esteemed by sportsmen is the large imperial sandgrouse (*Pterocles orientalis*) which breeds in Baluchistān and elsewhere beyond our limits and visits Rājasthān and neighbouring semi-desert areas in great abundance in winter.

The family Columbidae contains 6 species of green pigeons (*Treron*), 3 imperial pigeons (*Ducula*), 9 true pigeons (*Columba*), 2 cuckoo-doves (*Macropygia*), and 7 doves (6 *Streptopelia*, 1 *Chalcophaps*). Many of the above species are represented by several geographical races each, and both resident and migratory forms. The frugivorous green and imperial pigeons move about the country-side seasonally, dependent on the ripening of wild fruits such as nutmegs.

and the various figs (*Ficus*). Perhaps the most wide ranging of our fruit pigeons are the green *Treron phoenicopterus* and the imperial *Ducula aenea*. The wild blue rock pigeon (*Columba livia*), the ancestor of all domestic breeds, lives on cliffs in the hills. Its place in the Himālayas is taken by the particoloured snowpigeon (*Columba leuconota*) which ranges between 1,500 and 4,200 m. altitude. The rufous turtle dove (*Streptopelia orientalis*) has races breeding in the Himālayas as well as in Peninsular India and are augmented in winter by migratory races from beyond our boundaries. There other doves, common throughout the area, are the little brown (*Streptopelia senegalensis*), the spotted (*S. chinensis*) and the ring dove (*S. decaocto*). The lovely little emerald dove (*Chalcophaps indica*) occurs in the better wooded areas of the subcontinent.

**Order Psittaciformes :** The family Psittacidae is represented by 12 species of parakeets (*Psittacula*), many of them with geographical races. They are all predominantly green in coloration and have long, pointed tails. All are highly destructive to crops and orchard fruit, and possess few redeeming qualities from the economic point of view. The commonest species are the Alexandrine parakeet (*Psittacula eupatria*), the roseringed (*P. krameri*), the blossomheaded (*P. cyanocephala* and *P. roseata*) in the plains, and the rosebreasted and slatyheaded (*Psittacula alexandri* and *P. himalayana*) from the foot of the Himālayas to 2,500 m. altitude. The bluewinged parakeet (*Psittacula columboides*) inhabits the Western Ghāts. The dainty little lorikeet (*Loriculus vernalis*), short-tailed and of about the size of a sparrow, is found in the well-wooded parts of the country. It has the peculiarity of hanging head downwards, like a bat, when at rest.

**Order Cuculiformes :** The cuckoos have a practically worldwide distribution. Many of the Old World species, in particular, are notorious for their habit of brood-parasitism, i.e., laying their eggs in the nests of other birds and foisting on them the responsibility of hatching the eggs and rearing the young. Typical of the parasitic cuckoos is the well known *Cuculus canorus* of Europe which extends into Kashmir, Punjab and Uttar Pradesh and has a resident race (*bakeri*) in the Eastern Himālayas and Assam hills. It is met with as a vagrant in many parts of the Peninsula. Among our other parasitic cuckoos the commoner ones are the hawk-cuckoo or brainfever bird (*Cuculus varius*), the Indian cuckoo (*C. micropsterus*), and the koel (*Eudynamys scolopaceus*). The diminutive, brilliantly coloured emerald and violet cuckoos (*Chalcites maculatus* and *C. xanthorhynchus*) are largely parasitic on sunbirds and spiderhunters (Nectariniidae).

Some of our cuckoos are non-parasitic, i.e., they build nests and bring up their own young. Typical examples are the crow-phasants or coucals (*Centropus*), the malkohas (*Rhopodytes*) and the sirkeer cuckoo (*Taccocua*).

*Order Strigiformes*: The owls are represented by two families, namely, Tytonidae (barn owls), and Strigidae (true owls). The former is characterized by its pinched monkey like facial disc as in the familiar barn or screech owl (*Tyto alba*) of almost world-wide distribution. The true owls have large round heads, and large, staring, forwardly directed eyes. Some species possess erectile horn-like tufts of feathers above the head. They range in size from slightly larger than a sparrow, e.g., the pygmy owllet (*Glaucidium brodiei*), to larger and heavier than a kite, such as the rock horned owl (*Bubo bubo*). The smaller species which include our common spotted owllet (*Athene brama*) and the collared scope (*Otus bakkamoena*) prey on insects, mice and small birds; the larger ones, e.g., the forest eagle-owl (*Bubo nipalensis*), which is a large and powerful creature, hunt small mammals and birds of the size of pheasants and junglefowl.

*Order Caprimulgiformes* : Represented by the two families Podargidae (Frogmouths) and Caprimulgidae (Nightjars). Both consist of concealingly patterned, brownish and greyish, nocturnal or crepuscular birds with soft plumage as in owls, and very wide gapes like clap-nets adapted for capturing beetles and flying insects on the wing. The base of bill and gape are exceptionally wide in the frogmouths, and their Latin name *Batrachostomus* as well as the English are both aptly descriptive. The species *B. moniliger* is found in the southern Western Ghāts and Kerala, while *B. hodgsoni* inhabits the Eastern Himālayas. The great eared nightjar (*Eurostopodus macrotis*) also has a parallel discontinuous distribution in Kerala and the Eastern Himālayas, being represented by the race *boudilloni* in the former and by *cerviniceps* in the latter. Six species of nightjars of the genus *Caprimulgus*, with several geographical races, occur. Superficially they all look confusingly alike in the field, but may be readily distinguished by their calls.

*Order Apodiformes* includes the swift families, Apodidae (true swifts) and Hemiprocnidae (crested or tree swifts). The house swift (*Apus affinis*), the most familiar representative of the former, is commonly seen near human habitations, building its nests in clusters, or "villages", in the corners of ceilings of ruined as well as inhabited houses. Swifts are noted for their speed and manoeuvrability in flight, perhaps the most renowned in this regard being the Alpine swift (*Apus melba*) which nests in the fissures of cliffs around the Jog Falls in Mysore, and the large spinetail swifts *Chaetura*

*gigantea* and *C. caudacuta*. Several species of *Collocalia* swiftlets—which build the edible nests of commerce—are found in North-eastern and Southern India, and in the Andaman and Nicobar Islands. The crested tree swift (*Hemiprocne longipennis*) which, unlike the true swifts, possesses the ability of perching like a passerine bird, is seen hawking insects in the air, or perched on the topmost branches of a leafless tree in deciduous forest tracts.

*Order Trogoniformes*: Represented in our area by the family Trogonidae which is restricted to the Tropics of the Old and New Worlds. It contains brilliantly coloured forest-dwelling birds of rather sluggish habits. Three species occur in India : the Malabar trogon (*Harpactes malabaricus*) in the hilly forest tracts of Southern, Western and Central India; the redheaded (*H. erythrocephalus*) in the Eastern Himalayas and Assam; and Ward's trogon (*H. wardi*) in Bhutan and the Mishmi hills. Their diet consists of small fruits, insects and lizards.

*Order Coraciiformes*: Represented by the families Alcedinidae (kingfishers), Meropidae (bee-eaters), Coraciidae (rollers), Upupidae (hoopoes), and Bucerotidae (hornbills).

Our kingfishers comprise 5 genera, namely, *Ceryle* (2 species), *Alcedo* (3 species), *Ceyx* (1 species), *Pelargopsis* (2 species), *Halcyon* (4 species), with numerous geographical races. They are solitary birds, mainly non-migratory, living in the neighbourhood of water—estuary, river, lake, pond—and procuring their fish food by plunging from an overhanging perch or from the air while hovering. Some species, like the whitebreasted kingfisher (*Halcyon smyrnensis*), have become largely independent of water and live on insects, frogs, lizards and other small terrestrial animals.

The bee-eaters, predominantly green coloured, comprise the genera *Merops* (5 species) and *Nyctyornis* (1 species). The handsome bluebearded bee-eater (*Nyctyornis athertonii*) has a scattered distribution in moist forest biotope throughout the country. All the members of the family Meropidae are local or long-distance migrants whose movements are not well understood.

The rollers (family Coraciidae) include the broadbilled roller (*Eurystomus orientalis*), with 5 geographical races, resident in a moist forest biotope, and 2 species of the genus *Coracias* inhabiting drier, more open country. Of the latter, the migratory *C. garrulus*, the race *semenowi* breeds in Kashmir; the resident *C. benghalensis* in the rest of the country. They are brilliantly coloured birds, largely in shades of blue, commonly seen perched on telegraph wires alongside railroads, whence they pounce upon insects and small animals on the ground.

Four races of the hoopoe (*Upupa epops*) occur in India, all of which are more or less locally migratory.

The hornbills (family Bucerotidae) are well represented, particularly in the moist forest tracts. Six genera with 8 species and several geographical races are recognized, the largest and most spectacular of the group being the great pied hornbill (*Buceros bicornis*) of the southern Western Ghāts, Eastern Himālayas and Assam. Two smaller pied hornbills, *Anthracoceros malabaricus* and *A. coronatus*, together with the grey hornbill (*Tockus birostris*) occur patchily in the rest of the country. Hornbills are remarkable for their peculiar nesting habits. The female incarcerates herself within a tree hollow whose entrance is then partially walled up with mud and the birds' droppings. Until the eggs hatch and the young are a few days old, the male feeds his imprisoned mate. Then the wall is broken down and she comes out to help the male in feeding the young.

*Order Piciformes:* The woodpecker-like birds comprise the families Capitonidae (barbets), Indicatoridae (honeyguides) and Picidae (woodpeckers).

Barbets are mostly bright coloured but rather dumpy, fruit-eating birds with large heavy bills overhung around the base with well developed stiff bristles. All the 10 Indian species are currently grouped under the genus *Megalaima*. Some of the more prominent among them are the great hill barbet (*M. virens*) of which several races range along the entire length of the Himālayas and in the Assam hills. The green barbet (*M. zeylanica*) inhabits the forested tracts of Peninsular India. The smaller crimsonbreasted barbet or coppersmith (*M. haemacephala*), whose monotonous, ringing *tonk.....tonk* calls are amongst the most familiar bird voices on the country-side, has a very wide distribution in the plains.

The honeyguides (Indicatoridae) have their headquarters in Africa where many species are known. Only one, *Indicator xanthonotus*, occurs in India in the Himālayas and Nāga hills between 1,500 and 2,700 m. altitude. It is a rare bird, about the size of a sparrow, living largely on the larvae of wild bees and the wax of the honeycombs.

The woodpecker family (Picidae) is particularly rich. 15 genera and 32 species are recognized, many of them again with local races. They range in size from that of a jungle crow, e.g., the great black woodpecker (*Dryocopus javensis*) and the Himālayan slaty woodpecker (*Mulleripicus pulverulentus*), to almost smaller than a sparrow, e.g., the diminutive speckled and rufous piculets (*Picumnus innominatus* and *Sasia ochracea*). Woodpeckers live on an insectivorous diet consisting largely of the grubs of wood

boring beetles which they extract from within the trunks and branches of trees by means of their specially adapted bill and tongue. Modern forestry practices recognize the highly beneficial role they play in forest economy.

*Order Passeriformes*: Popularly known as perching birds or song birds, covers more than half of our total avifauna. It embraces a large number of superficially divergent families, all of which have certain well-defined anatomical features, such as the structure of skull and palate, and muscles of the syrinx, i.e., the lower end of windpipe which is the organ of voice production in birds. It is divided into 4 suborders, of which the 3 that concern us are: Eurylaimi containing the broadbills (family Eurylaimidae), the Tyranni containing the Pittas (family Pittidae), and the Passeres (or Oscines of some authors) containing the following heterogeneous array of families :

<i>Family</i>	<i>Genera</i>	<i>Species</i>
Alaudidae (Larks)	9	19
Hirundinidae (Swallows, Martins)	3	12
Laniidae (Shrikes)	1	9
Oriolidae (Orioles)	1	4
Dicruridae (Drongos)	1	9
Artamidae (Swallow-Shrikes)	1	2
Sturnidae (Starlings, Mynas)	6	18
Corvidae (Crows, Magpies, Jays)	8	22
 Bombycillidae :		
Subfamily Bombycillinae (Waxwings)	1	1
Hypocoliinae (Hypocolius)	1	1
Campyphagidae (Cuckoo-Shrikes, Minivets)	4	14
Irenidae (Fairy Bluebird, Ioras, Leaf Birds)	3	6
Pycnonotidae (Bulbuls)	4	19
 Muscicapidae :		
Subfamily Timaliinae (Babblers)	30	122
Muscicapinae (Flycatchers)	7	39
Pachycephalinae (Thickheads, Silky Flycatchers)	1	1
Sylviinae (Warblers)	22	91
Turdinae (Chats, Robins, Thrushes)	19	89
Troglodytidae (Wrens)	1	1
Cinclidae (Dippers)	1	2
Prunellidae (Accentors)	1	7
 Paridae :		
Subfamily Parinae (True Titmice)	2	12
Remizinae (Penduline Titmice)	2	2
Aegithalinae (Longtailed Titmice)	1	4

<i>Family</i>	<i>Genera</i>	<i>Species</i>
<b>Sittidae :</b>		
Subfamily Sittinae (True Nuthatches)	1	6
Trichodromadinae (Wall Creeper)	1	1
Salpornitinae (Spotted Creeper)	1	1
Certhiidae (Tree Creepers)	1	4
Motacillidae (Pipits, Wagtails)	2	18
Dicaeidae (Flowerpeckers)	1	9
Nectariniidae (Sunbirds, Spiderhunters)	4	14
Zosteropidae (White-eyes)	1	2
<b>Ploceidae :</b>		
Subfamily Passerinae (Sparrows)	3	13
Ploceinae (Weaver Birds)	1	4
Estrildinae (Munias)	2	7
<b>Fringillidae :</b>		
Subfamily Fringillinae (Chaffinches)	1	2
Carduelinae (Goldfinches and allies)	14	38
Emberizidae (Buntings)	2	16

An account of these families and subfamilies, and even of a few representative genera and species, would take more space than is available here. The interested reader is referred to the *Synopsis* by Prof. Ripley mentioned earlier. Volumes 1 to 8 of *The Fauna of British India—Birds*, by E. C. Stuart Baker, though out-dated in many respects, is still the best and most complete manual on the subject.

*Cl. 5. Mammalia (mammals) :* While our mammalian fauna exhibits great diversity in forms, certain groups are completely absent, such as: the Prototheria or Monotremes (duck-bill, spiny ant-eater) and the Metatheria or Marsupialia (kangaroos, opossums, koalas, etc.) which are peculiar to Australia; the camel\*, giraffe, zebra and hippopotamus amongst the "Ungulates"; and seals, walruses (order Pinnipedia) and Procavias (order Hyracoidea). About 186 general, 458 species (and 920 subspecies) are found in our region. The more important of the various types of mammals which occur may be referred to briefly.

\*"Large herds of domesticated forms of the one-humped camel, *Camelus dromedarius*, are kept in the North-western India for draught purposes. The species does not occur in the wild state in India or elsewhere."

1. Insectivora (shrews, moles and hedgehogs): About 38 species (and 83 subspecies) occur in the Indian region. Various subspecies of the common tree-shrew, *Tupaia glis*, are to be found, namely, *belangeri* (Wag.) (Burma), *assamensis* Wr. (Assam) and *lepecha* Thorm. (Darjeeling and Bhutān). In the south, *Anathana elliotti* (Water.) is the common form. Of the hedgehogs, two species are common : *Hemiechinus auritus collaris* (Gray) in the dry parts of North and North-western India to West Pākistān and Afghānistān, and *Paraechinus micropus* (Blyth) (Sind, North-western India and Madras). Of the moles, *Talpa micrura* Hodgs. is common in forests in the eastern region (Nepāl, Assam, Burma). Several species of shrews occur. *Suncus murinus* (Linn.) synonym *S. caeruleus* (Kerr.) is the common house shrew all over India. The Himālayan water-shrew, *Chimmarogale platycephala himalayica* (Gray) is found on the banks of streams all along the Himālayas, from Kashmir to North Bengal and on to Burma, Yunnan and Indo-China.

2. Dermoptera (flying-lemurs or cobegos): This small order of flying-lemurs contains a single genus, *Cynocephalus* (family Cynocephalidae), which ranges from South Burma to the Philippines. A single species, *C. variegatus peninsulae* (Th.), occurs in the Indian region and is confined to Tenasserim (S. Burma).

3. Chiroptera (bats and pipistrelles): The Indian chiroptera range in size from the large fruit-bats (wing-span c. 120 cm.) to the tiny pipistrelles. Nearly 123 species (and 180 subspecies) occur in this region. Two groups are recognizable : suborder Megachiroptera (large bats, all species fruit-eating), and suborder Microchiroptera (small bats, all species insectivorous and carnivorous). The common ones may be mentioned. Among the Megachiroptera, the Indian fruit-bat or flying fox, *Pteropus giganteus* (Brünnich), is a species most commonly seen hanging upside down in hundreds on trees during the day and flying in the evenings, all over India, Ceylon and Burma. Microchiroptera: This includes the rat-tailed bat, *Rhinopoma hardwickei hardwickei* Gray (all-India), the tomb bats (*Taphozous*), the false vampires (*Megaderma*) and the horseshoe bats (*Rhinolophus*), the leaf-nosed bats (*Hipposideros*), the pipistrelles (*Pipistrellus*), and the yellow bats (*Scotophilus*). The false vampire, *Megaderma lyra* Geoff., is common in caves and buildings all over India. The Indian pipistrelle, *Pipistrellus coromandra* (Gray), is widely distributed in India, Ceylon and Burma to South China. *Scotophilus heathi* (Horsf.) is commonly found in temples and old buildings all over India.

4. Primates (gibbons and monkeys) : About 21 species and nearly 59 subspecies occur in our region and are divisible into two suborders: Prosimii and Anthropoidea. The Prosimii is represented by a single family, the Lorisidae (lorises), with two genera, *Loris* and *Nycticebus*, and two species—the slender loris, *L. tardigradus* (Linn.) (with 6 subspecies) of Ceylon and South India, and the slow loris, and *N. coucang bengalensis* (Fischer), of Assam, Burma, Indo-China and Thailand. A third species, *N. pygmaeus* Bonh., is found in Indo-China.

The Anthropoidea is represented by two families—the Cercopithecidae (monkeys) and the Pongidae (Hylobatidae) (gibbons). Two genera, namely, *Macaca*, the macaques, and *Presbytis* (synonym *Semnopithecus*), the langur and leaf-monkeys, and 16 species (and 48 subspecies) are found, and they form some of the commonest animals to be seen in India both near human habitations and in the open forests.

*Macaca mulatta* (Zimm.), the bandar or rhesus macaque, the common pink-faced monkey seen in North India, usually lives in groups. Other common species are: the bonnet macaque, *M. radiata* (Geoff.) and the lion-tailed macaque, *M. silenus* (Linn.) of South India, the crab-eating macaque, *M. irus* (Cuv.) of the Nicobar Islands and Burma, and *M. assamensis* M'Cllel. of Assam, North Burma and Indo-China.

*Presbytis* includes the powerful, graceful, black-faced and long-tailed langur or Hanuman monkey, *P. entellus* (Duf.), commonly found all over India and Ceylon, with about 14 subspecies. The langurs live in large groups, preferring open rocky areas, and periodically invade houses in neighbouring towns and cities. Other common species are : the John's langur, *P. johni* (Fisch.) of South India, the capped monkey, *P. pileatus* (Blyth) of Assam and Burma with 5 subspecies, and the recently discovered golden langur, *P. geei* Khajuria in the Goālpāra District of Assam.

The Pongidae (Hylobatidae) includes the gibbons. It contains a single genus, *Hylobates*, with three species. The lar gibbon, *H. lar* (Linn.) and the siamang, *H. syndactylus* (Raff.), are confined to Tenasserim (South Burma) extending east to Malaya, etc. The hoolock gibbon, *H. hoolock* (Harlan), is common in the forests of Assam, East Bengal and Upper Burma; it occurs in two phases: a black phase and a pale phase. A fourth species, *H. concolor* (Har.), is extra-limital (Hainan, Indo-China, Thailand).

The higher Simian apes, namely the Gorilla, Chimpanzee and Orang-utan, are not found in our region.

5. Pholidota (pangolins or scaly ant-eaters): This contains a single family, Manidae, with a single genus, *Manis*, and three

species: *M. pentadactyla aurita* Hodgs., the Indian race of the Chinese pangolin, is found in Nepāl, Sikkim, Assam and Burma and further east to South China. *M. crassicaudata* Gray, the Indian pangolin, is found in a large part of India. *M. javanica* Desm., the Malayan pangolin, ranges from Burma and Malaya east to Indonesia.

6. Carnivora (cats, bears, dogs, foxes, jackals, otters, etc.) : Seven families, with 41 genera, 65 species and 146 subspecies, occur in our region.

- (i) Canidae: Two races of the wolf occur: The wooly wolf, *Canis lupus chanco* Gray, of Western Himālayas (Kashmīr and Chitrāl) to Turkestān, and the small Indian wolf, *C. l. pallipes* Sykes (all-India; West Pākistān to Irāq and North Arabia). The jackal, *Canis aureus* Linn., occurs throughout the region and several races are distinguishable. Four species of the fox, *Vulpes*, are found. The commonest species is the Bengal fox, *V. bengalensis* (Shaw) (all-India). The white-footed fox, *V. vulpes pusilla* Bly., occurs in the desert areas of Western India, Punjab and West Pākistān to South Irāq. Several races of the Indian wild dog, *Cuon alpinus* (Pallas), occur, the most widespread being *C. a. dukhunensis* (Sykes) (all-India, south of the river Ganga).
- (ii) Ursidae (bears): Four genera and four species occur: The snow, red or brown bear, *Ursus arctos isabellinus* Horsf., occurs in the Western Himālayas (Nepāl to Kashmīr) and Afghānistān. The sloth bear, *Melursus ursinus* (Shaw), is the common black bear found throughout India (except the western desert) and Ceylon. The large Himālayan or Asiatic black bear, *Selenarctos thibetanus* (G. Cuv.), ranges from Siberia, Japan, Manchuria, South China to Burma, Assam, west to Nepāl, Kashmīr, Baluchistān and Afghānistān; three races occur within our region. The Malayan bear, *Helarctos malayanus* (Raff.), ranges from Burma east to Malaya, Indonesia and South China.
- (iii) Procyonidae (Pandas): A single species, the lesser or red panda, *Ailurus fulgens* F. Cuv., is found and ranges from Nepāl, Sikkim and North Burma to South China.
- (iv) Mustelidae (martens, weasels, otters): Nine genera and 18 species occur in our region. The commonest otter found all over India is *Lutra lutra* (Linn.), with various races. Another widespread species is *L. perspicillata* Geoff., the smooth-coated Indian otter, (Sind and all-India east to Sumatra). The martens (*Martes*), stoats

and ermines (*Mustela*), polecats (*Vormela*) and badgers and ratels are fairly well represented.

- (v) Viverridae (civets, linsangs and mongooses): These animals are common throughout India and 18 species are found. The large Indian civet, *Viverra zibetha* Linn., ranges from Nepāl eastward to South China. The common palm civet or toddy cat, *Pardoxurus hermaphroditus* (Pallas), is familiar throughout the Indian region. The existence of stink glands in civets makes the presence of these animals very unpleasant in the vicinity of human habitations. The mongooses (*Herpestes*) are represented by five species: *H. edwardsi* (Geoff.), *smithi* Gray, *fuscus* Water., *auropunctatus* (Hodg.), and *vitticollis* Benn., the first two being the more common and widespread. (Some authors treat mongooses as a separate family, Herpestidae.)
- (vi) Hyaenidae (Hyaenas): A single species, the striped or Indian hyaena, *Hyaena hyaena hyaena* (Linn.), occurs and ranges from all-India (except Assam), Nepāl, West Pākistān, Afghānistān, Irān, west to Transcaucasia.
- (vii) Felidae (lion, tiger, cats, cheetah): Four genera (*Panthera*, *Felis*, *Neofelis*, and *Acinonyx*) and 16 species occur in our region.

*Panthera* is represented by 4 species: *Panthera pardus* (Linn.) is the panther or leopard which ranges widely from Africa to Asia and is divided into several races of which 4 are found in India; the most common is *P. p. fusca* (Meyer) (all-India, West Pākistān, Ceylon, Burma and South China). An all-black variety, which is an aberration, is not uncommon, and more rarely albinos also occur. The ounce or snow-leopard, *P. uncia* (Schreber), ranges from Central Asia to Tibet, and all along the Himālayas from Kashmīr to Sikkim. The tiger, *P. tigris* (Linn.), has also a wide range—from the Asiatic U. S. S. R. (including Ussuri and Amur regions and Siberia) to South China, Northern Afghānistān, Irān, Nepāl, most of India (except the western desert region and probably Kashmīr), eastward to Burma and via Malaya to Indonesia. Six races are recognized, of which the Indian race is *P. tigris tigris* (Linn.). Sometimes a tiger turns man-eater. The number of human deaths thus caused in India used to be considerable (866 in 1903), but is now much less, due to decrease in the number of tigers and the introduction of safer means of communication. The tiger is the largest of the living cats—a male weighs about 200-225 kg. and a female 160-180 kg. The lion, *P. leo* (Linn.), survives in tropical Africa and Western India (Gir forest, Kāthiāwār). Two races occur:

the African lion, *P. leo leo* (Linn.) (Africa) and the Asiatic lion *P. leo persica* (Meyer), the latter believed to have a smaller mane. (The belief that the Indian lion is maneless is unfounded.) Up to the middle of the nineteenth century, the lion was common all over West Pākistān and North India as far as West Bengal. Until 1860 or so, many existed in Kāthiāwār and Rājasthān. By 1880, they were confined to the Gīr forest (an area of about 1,300 sq. km.) in Kāthiāwār and only about a dozen heads were left—the last remnant of the Asiatic lion. Stringent protection since then has saved them, at least for the time being, and by 1930 their number increased to about 200; the 1955 Census gave their number as 290. In prehistoric times lions existed in Southern Europe (Greece), and in historical times in Syria and Palestine and until about a century ago in Arabia, Irāq and Irān.

Ten species of *Felis* occur in our region. *F. libyca ornata* Gray is the Indian desert cat (North-west and Central India). The common jungle-cat is *F. chaus kutas* Pears. (of North India) and *F. c. kelaarti* Poc. (of South India and Ceylon). The leopard-cat, *F. bengalensis* Kerr, is common all over India and so is the fishing cat, *F. viverrina* Benn. The lynx, *F. lynx isabellina* Bly., is found in Kashmīr, while the caracal, *F. caracal schmitzi* Mats., ranges from North-western India and West Pākistān to Arabia and Palestine.

*Neofelis* is represented by the clouded leopard, *N. nebulosa macrosceloides* (Hodgs.), found in the Himālayas up to about 915 m. from Nepāl to Burma.

The cheetah or hunting leopard, *Acinonyx jubatus* (Schr.), ranges from North Africa to West Asia and India. The Asiatic race, *A. j. venaticus* (Griffith), formerly ranged from North India (east to Bengal), West Pākistān and East Africa, but is now extinct in Asia. The cheetah differs from all other cats (Felidae) in the absence of the cutaneous lobes which form the protecting sheath of the claws, but the claws themselves are retractile as in other cats. It is one of the fastest runners known and, being docile, was used in India for catching game such as blackbuck.

7. Proboscidea (elephants): Of a once flourishing group of mammals (fossils are found all over the world except Australia), only two living genera, each with a single species, survive—*Loxodonta africana* Blumenle (African elephant) and *Elephas maximus* Linn. (Indian elephant), the latter having shorter ear-flaps. Several species have, however, been found as fossils in India in the Eocene and more recent formations. The elephant, which is the largest living land mammal of India (and the world), is found in forests all over India (except Kashmīr, Punjab and the

western desert), Ceylon, Burma and eastward to Sumatra. Three races occur in our region: *E. maximus indicus* Cuv. (India), *E. m. maximus* Linn. (E. Ceylon) and *E. m. ceylanicus* Blain. (Ceylon). Their numbers in India have declined during the last century, but they are still not uncommon in certain parts. Since elephants can be easily trained, they are used in many places for hauling logs and other work of that kind.

8. Sirenia (dugong): These "fish-like" creatures are represented by a single family, the Dugongidae (Manatidae), with a single species, the dugong, *Dugong dugong* (Müller). It occurs on the shores of the Indian Ocean from East Africa to Australia for about 15 degrees latitude on either side of the Equator, but has been largely exterminated and is now rare. Big specimens may be as much as 2·5 m. in length.

9. Perissodactyla (odd-toed ungulates): Three families and 5 species occur in the Indian region as follows:

- (i) Tapiridae (tapirs) : Represented by a single species, the Malayan tapir, *Tapirus indicus* Desm., which ranges from South Burma (Tenasserim) to Malaya and Sumatra.
- (ii) Rhinocerotidae (rhinoceroses): Three species occur: The great Indian one-horned rhinoceros, *Rhinoceros unicornis* Linn., is today confined to small patches in the East Himalayan *tarai* (Nepāl, Bihār, Bengal Duārs, Cooch Behar and Assam), and is becoming rare. In India it is confined to eight sanctuaries (the largest being the Kaziranga Sanctuary in Assam) in which the overall number is 400 rhinos, whereas in Nepāl it is confined to the Rāpti valley (about 300 heads). Five centuries ago, the rhino roamed over large parts of North India, west of the Hindu Kush mountains, along the Himalayan foot-hills and in Nepāl. By the year 1900 the number was drastically reduced and the Government started sanctuaries in Assam. The lesser one-horned or Javan rhinoceros, *R. sondaicus* Desm., ranged, about a century ago, from the Sikkim *tarai*, Bengal, Assam and Burma east to Thailand, Malaya, Sumatra and Java. It is now extinct except for about two or three dozen heads in the western tip of Java. The Asiatic or two-horned rhinoceros, *Didermocerus sumatrensis* (Fischer), occurred a century ago in Bengal and Assam, but is now extinct in India. A few heads survive in Burma (about 30-50), Indo-China, Malaya and Sumatra.
- (iii) Equidae (horses and asses): A single species, the Asiatic wild ass, *Equus hemionus* Pallas, is found in our region.

It ranges from Turkestān, Mongolia, Tibet, Nepāl, Ladākh, Baluchistān, Sind, Kutch and Afghānistān to Syria. Of its several subspecies two occur in our region—the Indian wild ass, *E. h. khur* Less., in Kutch, Baluchistān and South-eastern Irān and the kiang, *E. h. kiang* Moorcr., in Ladākh, Nepāl, Sikkim to Kokonor (Central Asia).

10. Artiodactyla (even-toed ungulates) : Four families and 37 species occur in our region as follows :

- (i) Suidae (pigs) : Two species are found. The first, the wild boar, *Sus scrofa* Linn., has 3 races in our region, as follows : *Sus scrofa cristatus* Wag. (all-India and Ceylon), *S. s. andamanensis* Bly. (Andaman Islands) and *S. s. nicobaricus* Mill. (Nicobars). The second species, the pygmy hog, *S. salvanius* (Hodg.), is found in the Sikkim tarai, Nepāl and Bhutān.
- (ii) Tragulidae : The Indian spotted chevrotain or mouse-deer, *Tragulus meminna* (Erxl.), ranges from Peninsular India to Ceylon.
- (iii) Cervidae (deer) : Ten species occur and the more common ones are : The musk-deer, *Moschus moschiferus moschiferus* Linn., (Himālayas from Kashmīr to North Burma); the barking deer, *Muntiacus muntjak* (Zimmer.) (all-India, Ceylon, South China, Burma to Indonesia); the chital or spotted deer, *Axis axis* (Erxl.) (all-India, Nepāl and Ceylon); the sambar, *Cervus unicolor* Kerr (all-India, Ceylon, Nepāl, east to the Philippines); the swamp deer or barasingha, *C. duvauceli* Cuv. (North India); the thamin or Eld's deer, *C. eldi* M' Clell. (Manipur, Burma to Indo-China and Hainan); and the Kashmīr stag or hangul, *C. elaphus hanglu* Wag. (Kashmīr); formerly abundant but now in danger of extinction, only about 550 heads being left.
- (iv) Bovidae (cattle, sheep, goats, antelopes) : This is a large family with 22 species in our region. The more common ones are as follows. The four-horned "antelope", *Tetraicerus quadricornis* (Blainv.), occurs in Peninsular India north to Madhya Pradesh. The nilgai or blue bull, *Boselaphus tragocamelus* (Pall.) is a large animal which is a pest of crops and ranges all over India, except East Bengal and Malabār. The genus *Bos* has several representatives: the gaur or Indian "bison", *Bos gaurus* H. Smith (Peninsular India in forested areas, Nepāl, Assam, Burma, Malaya, Indo-China), the banteng or

tsaine, *Bos banteng* Wag. (Burma and further east) and the yak, *Bos grunniens* Linn. (Ladākh, East Kumaun, Tibet, Central Asia). The yak is domesticated in the Himālayas. The Indian buffalo, water buffalo or arna, *Bubalus bubalis* (Linn.), survives in its wild state in Nepāl, Assam, Madhya Pradesh and Orissa (?). The domesticated animals are used extensively all over India as milch cattle and for draught. The origin of the common humped cattle or zebu, *Bos indicus*, of India is unknown but is believed to be tropical, possibly African; it has no relatives among fossils found in India, and is also markedly different in colour, voice and habits from the European domestic cattle, *B. taurus*.

The antelopes are represented by a few species. The common ones are the blackbuck, *Antilope cervicapra* (Linn.) (all-India) and the chinkara or Indian gazelle *Gazella gazella bennetti* (Sykes) (West Pākistān; plains of North India, south to the Krishna river). The "goat-antelopes" are represented by the serow, *Capricornis sumatrensis thar* (Hodgs.) (Kumaun, Nepāl, Sikkim), the goral, *Nemorhaedus goral* (Hardw.) (all along the Himālayas, China and Siberia) and the takin, *Budorcas taxicolor* Hodgs. (Bhutān, east to Assam, North Burma and South China). The sheep and goat occur in the mountainous regions. The urail, *Ovis orientalis vignei* Bl., is found in Ladākh; the bharal or blue sheep, *Pseudois nayaur* (Hodgs.) from Kashmir to Sikkim, Tibet and South China; the Asiatic ibex, *Capra ibex sibirica* (Pall.), from Kashmir to Kumaun in India and also in Central Asia, Afghānistān and Siberia; and the markhor, *Capra falconeri* (Wag.), in Kashmir, Punjab, Baluchistān to Afghānistān and Turkestān. The wild goat, *Capra hircus blythii* Hume, occurs only in Sind, Baluchistān and Turkmenia.

11. *Lagomorpha* (hares and pikas): This includes two families and 14 species in our region, as follows:

- (i) *Leporidae* (hares) : Two genera and 7 species are found, the common ones being the Indian or black-naped hare, *Lepus nigricollis* F. Cuv., with 8 races (all-India, except Kashmir and Bengal, Ceylon), the wooly hare, *L. oostolus* Hodgs. (Kashmir, Nepāl, Sikkim and China); and the Assam rabbit or "Hispid Hare", *Carpolagus hispidus* (Pearson) (North-east India: Uttar Pradesh, East Bengal, Assam; and Nepāl.)
- (ii) *Ochotonidae* (pikas or mouse-hares): Seven species of pikas (*Ochotona*) occur in the Himālayas and go up to about 4,875 m. altitude.

12. Rodentia (squirrels, marmots, porcupines, jerboas, gerbils, rats, mice and bandicoots): This is the largest order of mammals and comprises 6 families and 47 genera, about 125 species and 318 subspecies in our region. It includes many economically important species, viz., rats and mice (Muridae), which are serious pests of crops and stored food and are also carriers of diseases such as plague. Only a brief mention of the more common species is possible here.

(i) Sciuridae (squirrels and marmots) : About 36 species are found in our region. Several species of flying squirrels occur in the forests from Kashmīr to Burma, as well as in South India (Kerala) and Ceylon. The limbs on either side are united by a membrane which forms a parachute for descending from tree-tops. The large brown or common giant flying squirrel, *Petaurista petaurista* (Pallas), with several races, is widely distributed (all-India, except western desert, etc.; Ceylon; Burma to Indonesia; Hainan). The small Travancore flying squirrel, *Petynomys fuscocapillus* (Jerd.), occurs in South India (Kerala) and Ceylon. Of the other squirrels, several genera occur. Two species of striped squirrels are among the most common mammals seen in India near human habitations—these are the northern five-striped palm squirrel, *Funambulus pennanti* Wr. (North India, south to Orissa, Southern Madhya Pradesh and Dhārwar; also Nepāl and West Pākistān); and the three-striped or Indian palm squirrel, *F. palmarum* (Linn.) (Peninsular India, South Bihār, Ceylon)—formerly the two species were confused with each other and lumped under *palmarum*. The Indian giant squirrel, *Ratufa indica* (Erxl.), ranges from Peninsular India north to Orissa.

Two species of marmots (*Marmota*) occur in the Himālayas.

- (ii) Hystricidae (porcupines) : It has three species of which the most widespread is the Indian crested porcupine, *Hystrix indica* Kerr (all-India; Ceylon; Nepāl; West Pākistān; west from Irān, Arabia to Syria; also Central Asia).
- (iii) Dipodidae (jerboas); and (iv) Muscardinidae (dormice). Two species of jerboas occur in Kashmīr and Baluchistān. Similarly, two species of dormice occur—one in West Pākistān and another in South India.
- (v) Rhizomyidae (bamboo rats) : Four species occur in our region and are found in the eastern parts (Assam and further east).
- (vi) Muridae (rats, mice and bandicoots, hamsters, gerbils and

voles): This is the largest family of the Rodentia in our region, with 28 genera, about 80 species and nearly 200 subspecies. Rats and mice (Murinae) are very common. The common house rat or black rat of India is *Rattus rattus* (Linn.), with several subspecies, the commonest one being *R. r. rufescens* (Gray)—the domestic or commensal form has a grey venter whereas the corresponding field variety in the neighbourhood is white-bellied, the two varieties occurring together extensively. The brown rat, *Rattus norvegicus* (Berken.), is a Central Asian and European species which has spread, through shipping, to our major ports as well as to ports all over the world. The common house mouse of India is *Mus musculus* Linn., with several races. Three species of bandicoots occur: the lesser bandicoot rat, *Bandicota bengalensis* (Gr. & Hardw.), the large bandicoot rat, *B. indica* (Bech.), and the short-tailed bandicoot rat, *Nesokia indica* (Gr. & Hardw.). All of them are widespread and cause considerable damage to crops.

Of the hamsters (Cricetinae), two species occur: The grey hamster, *Cricetus migratorius* (Pallas) with 2 or 3 races (Kashmīr and Baluchistān) and the short-tailed Tibetan hamster, *C. alticola* Th. (Kashmīr and Tibet).

Of the jerds and gerbils (Gerbillinae), there are 3 genera (*Gerbillus*, *Tatera* and *Meriones*) in our region. The commonest gerbils are the Indian hairy-footed gerbil, *Gerbillus gleadowi* Murray (West Pākistān, and Gujarāt); the Indian gerbil or antelope-rat, *Tatera indica* (Hardw.) (nearly all-India except East India, Ceylon and Nepāl; also Irāq, Arabia and Syria); and the Indian desert gerbil, *Meriones hurrianae* (Jerd.) (West India, West Pākistān, Afghānistān and Irāq).

Six genera and 10 species of voles (Microtinae) inhabit the Himālayan region from Kashmīr to Tibet.

13. Cetacea (whales, porpoises and dolphins): The cetacea are truly aquatic throughout their lives and live in both fresh waters (rivers and estuaries) and the sea. Six families, with 15 genera, 25 species and 26 subspecies, occur in the Indian region and are briefly discussed below:

(i) *Balaenopteridae* (whales and rorquals): Three species of *Balaenoptera* are found in our seas. Of these *B. musculus* (Linn.) (syn. *B. indica* Blyth) is the largest known animal, whether living or extinct, and grows up to 24-27 m. in length.

- (ii) Platanistidae (dolphins) : A single species, the Ganga dolphin or susu, *Platanista gangetica* (Lebeck), is common in the rivers Ganga, Brahmaputra and Indus. It is about 7-8 ft. or 2-2·5 m. and sometimes 12 ft. or 3·6 m. long and is quite blind.
- (iii) Physeteridae (sperm whales) : Two species occur in our seas: the pygmy sperm whale, *Kogia breviceps* (Blain.) and the sperm whale, *Physeter catodon* Linn. (syn. *P. monocephalus* Linn.). Both are world-wide in distribution.
- (iv) Ziphidae (beaked whales) : A single species, Cuvier's beaked whale, *Ziphus cavirostris* G. Cuv., occurs in our seas.
- (v) Phocaenidae (porpoises) : A single species, the little Indian porpoise, *Neomeris phocaenoides* (G. Cuv.), occurs in our seas, in shallow waters and in tidal creek; it also ascends rivers in China. It is a small black animal, about 110-125 cm. long and 70-80 cm. in girth.
- (vi) Delphinidae (dolphins and killer whales) : About 9 genera and 17 species occur in our waters. The Irrawady dolphin, *Orcaella brevirostris* (Owen), ranges over the Bay of Bengal and the South-eastern Indian Ocean; the race *O. b. fluminalis* Anders., is found in the Irrawady river, Burma, as far north as Bhamo. The Indian pilot whale, *Globicephala macrorhyncha* Gray (synonym *G. indicus* Blyth), was recorded once, in a shoal in the Hooghly river, near Calcutta; it ranges all over the Indian and Pacific Oceans.

### 3. Game Animals and the Preservation of Wild Life

#### *Game animals*

A century ago wild life in India was plentiful, and so was game. Even half a century back it was not unusual to see herds of blackbuck, chital and gazelle as one sped across the countryside in a railway train. Extension of agriculture to forest lands, excessive hunting, the increase of human population and other factors contributed to the decline of wild life and game. During the two World Wars game was exploited ruthlessly. Foreign soldiers killed game at will and completed the process of decline in the abundance of our wild life.

Several species have either become extinct (e.g., the cheetah or hunting leopard) or are on the verge of extinction, only a few heads being left in the protection of sanctuaries; the Asiatic lion, the rhinoceros, the Kashmir stag and the great Indian bustard are examples. Some game, however, such as ducks, is still plentiful today. The following are some of the common game animals (mammals, birds and fishes):

Mammals: spotted deer or chital, blackbuck, sambar, nilgai (held sacred in certain areas), Indian bison (rare), bears, panther and tiger.

Birds: Ducks and geese (small and large), whistling teals, comb-bill or nukta, brahminy duck, sheldrake, common teal, pintail, pochard, etc.; black partridge, grey partridge, quails, snipe, red jungle-fowl, grey jungle-fowl and sandgrouse.

Fishes: (i) Marine: Hammer-headed shark, saw-fish, skates, rays, tarpons, sword-fishes, dolphin-fish and spear-fish, (ii) Fresh-water: Indian trout, mahseers (4 species), goonch, pungas cat-fish, garva and bachhwa.

### *Preservation of wild life*

With the rapid decline of wild life, the problem of its preservation has become urgent. The Governments, both the Central and of the States, are very much alive to the need. Sanctuaries for Asiatic lion in its last refuge in Asia (the Gir forest in Gujarāt), and the rhinoceros (in Assam and Northern Bengal) were formed in the early part of the century at the instance of the Government of India. Private scientific societies, such as the Bombay Natural History Society, and more recently the Zoological Society of India, are playing an important role in creating consciousness about wild life preservation among the public. Religious beliefs of certain sections of Hindus, particularly in Rājasthān and Gujarāt, have been responsible for wild life preservation in those areas. The peacock, which has become rare in other parts of India, is still common there due to the protection offered.

In January 1935, the Government of India held an All-India Conference for the Preservation of Wild Life and a policy of protection was formulated. An Indian Board for Wild Life was set up in 1952 by the Government of India and all the States now have similar Boards. These Boards, by propaganda, by the regulation of export of rare animals and the creation of wild life sanctuaries and reserves, help in protection.

Under the Trade Control Order the export from India of the following animals or their parts is totally banned:

<i>English name</i>	<i>Scientific name</i>
<i>(a) BIRDS</i>	
Great Indian bustard	<i>Choriotis nigriceps</i> (Vigors)
Jerdon's courser	<i>Cursorius bitorquatus</i> (Blyth)
Mountain quail	<i>Ophrysia superciliosa</i> (J. E. Gray)
Pinkheaded duck	<i>Rhodonessa caryophyllacea</i> (Latham)
Whitewing wood duck	<i>Cairina scutulata</i> (S. Müller)
<i>(b) MAMMALS</i>	
Asiatic lion	<i>Panthera leo</i> (Linn.) (subspecies <i>persica</i> Meyer)
Hunting leopard or cheetah	<i>Acinonyx jubatus</i> (Schreber)
Indian rhinoceroses	<i>Rhinoceros</i> spp.; <i>Didermocerus sumatrensis</i> (Fischer)
Brow-antlered deer (Thamin or Eld's deer)	<i>Cervus eldi</i> McClelland
Hangul (Kashmir stag, red deer)	<i>Cervus elaphus hanglu</i> Wagner
Pigmy hog	<i>Sus salvanius</i> (Hodgson)
<i>(c) REPTILES</i>	
Crocodiles	All species, including the gharial

About 47 wild life sanctuaries, reserves and national parks exist in India. They vary from tiny areas of about 23 sq. km. to large parks of nearly 1,550 sq. km. Six of them cover an area varying from 427 to 1,510 sq. km. the remaining being smaller. While some of these sanctuaries are meant for the preservation of certain specified species, others are more general in their scope. Among the former may be mentioned the Gir forest (Gujarat), the Jaldapara sanctuary (West Bengal), and Kaziranga sanctuary (Assam).

These parks and sanctuaries not only preserve our wild life heritage but also serve other vital functions. They preserve the areas of scenic beauty and provide healthy holiday resorts for the masses. They protect the fauna and flora in the natural state and serve as places for the ecological study of wild life in general and special problems such as bird migration. Further, the large forest reserves favourably affect climate and induce more rain.

*4. The Basic Ecological Balance between Man and Wild Life*

In common with other economically developing countries of the world, particularly those of Asia and Africa which have won their independence since the Second World War, a problem India has to face and solve with wisdom is that of Nature Conservation and Wild Life Preservation; in other words, to reconcile the demands of our ever-increasing human population and expanding economy with the undeniable right of wild life to exist. Such reconciliation can be achieved only by a critical, scientific assessment of the basic ecological balance between Man and wild life, or perhaps better, between Man and Nature. The Indian Board for Wild Life, constituted in 1952 for advising the Government of India on matters of policy in this regard, is an eloquent token of official recognition of this necessity. Wild life in India includes not only the mammals and birds that are normally hunted for sport or meat, generally classified as Game, but also all other animals, big and small, that comprise the rich Indian fauna. Judging from the standpoint of Man, some of these may appear to be unimportant, while others are clearly of vital significance to his interests as friends or foes. Whatever their apparent status, all organisms have an important role to discharge in the delicate web of life. Bitter experience in other parts of the world has taught the lesson that it is unwise to resort to seemingly obvious short-cuts and tamper with a life-community by exterminating one member of it, since that may well transform the entire community and bring about results the opposite of those desired. The folly of too simple shortcuts has been demonstrated so often that it seems unnecessary to cite examples here.

This section is concerned only with the larger terrestrial animals of the Indian country-side—mammals and birds—whose existence is increasingly threatened by the rapid growth of industrialization and land exploitation resulting from the successive Five Year Plans. The opening up of vast tracts of country which had been forest, scrub jungle, swamp or waste land, the erection of gigantic multipurpose dams with the submergence of enormous areas that once gave refuge to wild life, the advent of great hydro-electric power generating stations to run the heavy industries, the reservoirs and river valley projects which will irrigate millions of hectares of waste land, are rapidly altering the natural face of the country. Wild life is everywhere being steadily pushed to the wall. Not only are the animals deprived of their natural habitats but their direct persecution and slaughter are intensified by these processes of civilization.

While it is not yet too late to save what is left, it seems essential to take stock of the position and analyze the status of our wild life *vis-à-vis* the human population; that is, the ecological balance between Man and wild life in this country. The all-too-simple remedy offered by some that wild life wherever it conflicts with Man's interests must without question be destroyed, fails to take count of the complex repercussions that are almost certain to follow. In their untampered natural environment, where each species is adapted to fill its own particular niche, organisms adjust themselves to co-exist in a state of ecological equilibrium. It is only when Man appears on the scene to disturb this delicately poised natural balance that he begins subjectively to assess the harmful or beneficial impact of wild life upon his own concerns. A well known instance of such artificial upsetting of the ecological balance is that of the man-eating tigers which became a menace to the country-side in the Ganjam District of Andhra Pradesh, over hundreds of square kilometres. The cause of this sudden calamity was traced to this fact : the forest deer and pig on which the tigers had normally subsisted had been so reduced in numbers by professional poachers and others that, deprived of their natural food, the animals were driven to cattle-lifting, and on to man-eating. In parts of Madhya Pradesh, on the other hand, due to exceptionally heavy shooting pressure on the larger carnivora, deer and wild pig multiplied so much that their depredations made the raising of crops around forest villages impossible.

Man upsets the balance of nature by reducing or eliminating the appropriate natural habitats as also by introducing new species of plants and animals (along with their attendant pests and diseases) into habitats where they did not exist before. The removal of natural predators, or an unnatural abundance of food encourages certain species to become dominant at the expense of others. The disastrous effects of introducing the mongoose in the West Indies, and of the rabbit in Australia, are too recent to need reminding.

In order to preserve a dwindling rare animal, it is usually not enough to let Nature take its course. Where the reduction in numbers has been due to Man's interference as in the case of our one-horned rhinoceros and the great Indian bustard, complete stoppage of killing and restoration of the natural habitat may prove effective. However, sometimes animals begin to die out unaccountably. When this happens, recovery is difficult and the animals may be regarded as doomed. Our unique indigenous pinkheaded duck (*Rhodonessa caryophyllacea*) appears to have become extinct in this way. Only a critical study of the ecology of the species can provide a clue to the factors that tilted the balance against it.

Even the normal, legitimate activities of Man make his direct or indirect interference with natural environments inevitable, often producing a serious ecological imbalance. Cultivation of his crops introduces an element of unnatural uniformity into a diversified natural environment, as when a forest is cleared or a swamp reclaimed and converted into farm land. Each species of plant may have a set of animals dependent upon it for food. In a tropical mixed forest habitat with its diverse plant species, animal life is much richer in variety. The actual number of individuals of each species may be smaller than in crop land, where there is greater abundance but more uniformity in the food supply. Uniformity of vegetation produces a reduction in the variety of dependent animal species, but a corresponding increase in the number of individuals. With foresight, the judicious utilization of available scientific knowledge and adaptation of modern techniques to local requirements, we can easily tip the man-made ecological imbalance to our own advantage. After a critical study of the life histories and population dynamics of our game animals and game birds, for instance, it should be possible to harvest an artificially induced surplus for augmenting the nation's food supply without depreciation of the national heritage that is our wild life.

In a natural forest the number of deer, pig and other herbivores is regulated by the grazing and browsing available, and also by predatory carnivores. If, for some reason, the population of herbivores increases beyond what the forest can support, the animals will suffer from under-nourishment, and their weakened condition will make them more susceptible to predation and to disease. The excess will thus be automatically killed off and the ecological equilibrium restored. However, when Man interferes with the natural environment and, say, replaces mixed forest by pure stands of a few selected tree species, or by extensive cultivation of some particular crop, he upsets the natural balance and unwittingly invites the herbivores to concentrate from far and near on the lavish supply of the food he thus provides. Released from their natural checks, the animals multiply and may in time become serious pests. That applies to granivorous birds also. Species that are of neutral economic status from Man's viewpoint while in their natural habitat and subjected to the natural controls, may suddenly explode into "plagues" when those checks are relaxed, as by an artificial removal of their predators or the provision of a super-abundant food supply in cultivated areas. This is what we see happening in the case of our sparrows and weaver-birds (family Ploceidae). Quick to profit from the situation, they concentrate in large numbers around paddy, *jowār*, and *bājra* cultivation, often

causing serious damage to the ripening crops. The natural food of these birds is seeds of grass and weeds; where cultivation has not encroached on their native habitats, they live in small scattered flocks and wander about the country-side in search of food. Although the damage caused by weaver birds to food crops in India is nowhere of the same magnitude as by their relatives, the diochs (*Quelea quelea*) in the newly introduced rice cultivation in Equatorial Africa, it is sometimes quite considerable locally. The weaver birds furnish a good example of how a naturally neutral species can rapidly transform its economic status to one of serious harmfulness when Man intervenes to upset the ecological balance.

In recent forestry practices it has been customary to select, encourage and propagate certain tree species—such as teak and sal in the plains, and deodar and other conifers in the Himālayas—calculated to yield the maximum revenue. This frequently leads to the artificial replacement of the original mixed forest by more or less uniform stands. Such “managed” forests result not only in eliminating the unwanted species of trees and shrubs, but with it also the fauna that is directly or indirectly dependent on them. This, and the removal of all dead and decaying trees, results in depriving many birds of the insect food they obtained from the holes and crannies in the wood and under the bark, as also of the hollows in the rotten trunks and boughs which afforded suitable nesting sites. So the birds are forced to move elsewhere. Uniform stands of selected tree species tend to suffer more severely during outbreaks of defoliating or wood-destroying insect plagues. The pests, attracted by the concentrated abundance of the food supply, swarm in these forests as their counterparts do in cultivated crops. The impoverishment of bird life removes the control exercised by the natural predators, and exposes the trees to the full severity of the insects’ ravages. After the first flush of enthusiasm for severely managed forests, intelligent foresters, here as elsewhere, are now beginning to question the economic soundness of that system; and many devices are introduced, such as artificial nest boxes, in an attempt to lure the birds back and thus restore the ecological balance.

for roads, education, and the stronghold of finance and the tariff-protecting manufactures. She is the natural opponent of the agricultural interests of the West and the South, and of those railway rates controlled by the Interstate Commerce Commission which give an advantage over her ports to those further South. She and New York, New Jersey and Pennsylvania controlled the Republican Party until the West grew strong enough to flood the party with their own Progressivism.<sup>1</sup> A Boston editor supported the Governor of Massachusetts, who in 1922, said that New England was a 'unit', by adding: 'While certain artificial limitations exist between the New England states, there are no real barriers between them; essentially they are one.'<sup>2</sup> Formally this Sectionalism is symbolized by the Conference of the Governors of New England states, and a New England States Council composed of various economic groups has been established to speak for the area on semi-official occasions'. Further, a New England Bureau has been set up at Washington. 'Adjustments are in fact', says Turner, 'made not between individuals in the Nation, nor between states, but between sections'. He gives as examples that when the tariff was shaped by Southern and Western interests, instead of a centralized bank plan, a regional bank reserve system was adopted. An agricultural Bloc<sup>3</sup> composed of Western Republicans and Southern Democrats cuts across party lines for the benefit of the agricultural areas. And the Middle West has, on several occasions, exerted itself to the extent even of forming such new groupings as the Grangers, Populists, Progressives, the Non-Partisan League, the Farm Bureau Federation and the Farmers Bloc.<sup>4</sup>

We are therefore justified in saying this at least: that the American Federation does, in fact, rest upon a federal relationship between the Sections, and this relationship is realized not through the formal legal acknowledgement of Sections, but through the formal legal recognition of the states which are still the juristic counterparts of the Federation. The vociferous boosting of their own State by Americans is not evidence of any antagonism to the Union. It is, therefore, not surprising to find that the Senate is not representative of the states in the sense required by those who, at the foundation, secured equality of representation in the Senate. National and Sectional development have reduced the value of the Senate as the arena of states.)'

<sup>1</sup> Cf. A. N. Holcombe, *The Political Parties of To-day*, 2nd Ed., New York, 1925; E. M. Sait, *American Parties and Elections*, New York, 1927; R. C. Brooks, *Political Parties and Electoral Problems* (Harper), 1923.

<sup>2</sup> Turner, article cited, p. 15. Here also appears a citation from the *Boston Transcript* in the Spring of 1922. 'The New England states have different governments and are separate and distinct political organizations, but they are bound together by geographic, historic, political and industrial interests.'

<sup>3</sup> Capper, *Agricultural Bloc* (Harcourt), 1922.

<sup>4</sup> Cf. M. Ostrogorski, *Democracy and the Organization of Political Parties*, trans. from the French by F. Clarke, 2 vols., London, 1902, II.

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## CHAPTER VI

### THE PEOPLE

#### 1. *Physical Characteristics*

MEN OF SCIENCE believe that all the races of mankind belong to a single zoological species. The apparent distinctions in skin-colour, stature, form of the head, character of the hair, and certain chemical constituents of the blood are of a minor order, they overlie deeper similarities which unite all men into one biological species.

Yet the question remains : How did these differences come into being? It is well known that men cannot intermarry so freely as to bring about an average uniformity of physical type. People generally marry within a close-knit social circle in which many points of likes and dislikes are shared. Then there are notions of beauty, and preferences in the matter of physical types. The size of the mating group may be large or small ; but if the preferences operate over a long stretch of time, certain characteristics become segregated and one population is marked off from another by visible differences.

Nature also plays a part. People endowed with particular physical characteristics may survive in larger numbers under particular conditions of nature, while others may tend to disappear.

It is in one or the other of several such ways that mankind has gradually become divided into what are popularly called races. Some of the differences lie in the field of anatomy and some in physiology. But once the differences arise and become stabilized in time, they tend to persist. When members of one physical type migrate to the place of another, the two remain roughly distinguishable over a long period of time unless there is free intermarriage.

This is of importance in history. The civilization of a country is built up by various communities and if the facts about the origin and migration of those communities are reliably established through the study of biological characteristics, the study of the history of civilizations will be helped as well.

Systematic study of the physical characteristics of the people of India began about seventy years ago. The present population of India is over 439 millions. If we take into account the number

of deaths in the last seventy years, the total population involved is nearly twice the above number. Out of these vast masses of people, anthropologists have succeeded so far in sampling hardly more than 50,000 individuals. Risley, in his *The People of India*, noted on the basis of census data that there were 2,378 main castes among the Hindus in India; and that number has gone up in the last half-century. In theory, the communities restrict marriage to their own group; in practice, marriage is limited to even smaller groups, so that these are several times more than the number of castes. Besides, the non-Hindus—Muslims, Christians, Pārsis, and many tribal societies—limit marriages to their own respective communities.

All these mating groups are not evenly represented in the 50,000 sample which has already been studied in India. Meanwhile, the science of physical anthropology has steadily advanced. Observations made fifty years ago are not always comparable with those which now seem to be of importance.

The present survey of the physical characteristics of the Indian people has to be within the framework of limitations in the available data.

Travelling in India from north to south, or from west to east, one notices that individuals of fairer skin-colour or comparatively tall stature are, generally speaking, more frequent in the north and west than elsewhere. But, asked to draw a line on the map showing where one type ends and another begins, one discovers that there can hardly be any such line because of the overlapping. It will accordingly be more reasonable not to go by personal impressions but depend on measurements of physical characteristics. This survey is limited to a few factors: stature; the proportion of the breadth of the head to its length; and the proportion of the breadth of the nose to its height. Perhaps the character of the hair, certain chemical constituents of the blood and markings on the palms and fingers are genetically more stable and more useful for tracing affiliations; but then, adequate data on those points are not available. Cruder criteria have to be accepted, even though all measurements between the years 1900 and 1960 were not taken according to the same technique.

Broadly speaking, stature or St. can be split into the following categories (for males):

Very short	(1,300 mm. — 1,499 mm.)
Short	(1,500 mm. — 1,599 mm.)
Medium	(1,600 mm. — 1,699 mm.)
Tall	(1,700 mm. — 1,799 mm.)
Very tall	(1,800 mm. — 1,999 mm.)

Cephalic index or CI is obtained by finding out the percentage which the breadth of the head bears to its length. These are divided thus :

Hyperdolichocephal (very long head)	(X — 70·9)
Dolichocephal (long head)	(71 — 75·9)
Mesocephal (medium head)	(76 — 80·9)
Brachycephal (broad head)	(81 — 85·4)
Hyperbrachycephal (very broad head)	(85·5 — 90·9)
Ultrabracphycephal (extremely broad head)	(91 — X)

The nasal index or NI is obtained by finding out the ratio in percentage which the breadth of the nose bears to its height; and noses are accordingly classified thus:

Hyperleptorrhine (very long nose)	(X — 54·9)
Leptorrhine (long nose)	(55 — 69·9)
Mesorrhine (medium nose)	(70 — 84·9)
Chamaerrhine (broad nose)	(85 — 99·9)
Hyperchamaerrhine (very broad nose)	(100 — X)

Classification into categories is not always possible, since average values alone can be obtained. In such instances we have tried to compare findings from classified data or data of class I with the averages, which has been called data of class II; and it can be stated that the results so obtained are in general agreement with one another.

### *South India*

In Madras, out of about 30 million people (1951 Census), the Scheduled Castes form 17·95 per cent and the Scheduled Tribes, 0·45 per cent. In the classified data of class I, one Madras tribe, the Toda, is represented, while there are only seven castes, namely, Shānār, Parawan, Parayan, Pattanavan, Vellāla Ahambādian and Sembadavan. The Muslim sample is of 11 individuals only,\* and can therefore be ignored.

Among the Toda, stature is tall in 32% and medium in 59%. 75% are dolichocephalic and 21% mesocephalic. 59% are mesorrhine and 36% leptorrhine. Among the seven castes, stature is medium in over 50%, the head is mesocephalic in above 50%, and except in the case of the Shānār who are 41% brachycephal.

\*Henceforth, sample sizes will be placed within brackets without any further explanatory note.

The nose is mesorrhine in nearly 60%, the Parawan having 23% chamaerrhine; and Shānār leptorrhine 28%, chamaerrhine 12%.

Data of class II are available for 8 tribes, 15 castes and 2 communities. Among the tribes, Ceroumas (?), Iruḷa (40), Solaga (20), Pulayan (?) and Kota (21) are short statured and Badaga (28), Malasar (50), Pallan (52-?) and Toreya (40) are medium. Ceroumas, Iruḷa, Malasar and Solaga are dolichocephal and Toreya, Pallan and Pulayan are mesocephalic. Except the Malasar and Solaga, who have chamaerrhine nose, others are mesorrhine.

Castes of class II are medium in stature, excepting one, namely, Kammālan (40), which is short. Eight castes, namely, Palli (40), Pallan (50), Kammālan (40), Malayāli (50), Cakkiliyan (50), Ambaṭṭan (29), Agamudaiyan (40) and Parayan (40) are dolichocephalic and five are mesocephalic. Only two castes, namely, Sukun Sālē (30) and Suka Sālē (30) are brachycephalic. In nasal character all are mesorrhine.

The two communities, Oddē (40) and Māppilla Mohammedan (40) are medium statured and mesorrhine, but the former is mesocephalic and the latter dolichocephalic.

In Kerala, out of a population of nearly 14 millions, the Scheduled Tribes form only 1%. Yet, in the available data for class I, altogether 23 communities are represented ; Kerala among them are 18 tribes, 4 castes, and 1 formed by the White Jew (22 only).

Short stature is predominant among all communities. White Jew and Sambavan tend to be tall, but the size of the sample is too small. The majority of the people are dolichocephalic; but the Sambavan caste is mesocephalic and so are the Parayan and Malapantāram, as well as the Paliyan tribe. Pulayan have equal distribution of dolichocephal and mesocephal. More than 50% of noses are mesorrhine, though there are striking exceptions. Broad noses of chamaerrhine character are seen among the following castes : Nāyādi 41% (and 5% hyperchamaerrhine), Sambavan 52%, Parayan 33%, and the following tribes : Paṇiyān 59% (and 6% hyperchamaerrhine), Ullāṭan 77%, Malakuravan 80%, Muthuvan 77%, Malavettān 76%, Mala Pulayan 54%, Pulayan 56%, Mala Arayan 59% and Kaṇikar 55%.

Data of class II yield the following picture. Tribes bearing the names of Veṭṭakuruba, Jēnukuruba and Ilava are all short statured, dolichocephalic and mesorrhine.

The Nāyar (60) and Nambutri (55) are both very important castes in Kerala; but sample sizes are small. The Nāyar tend to be above medium in stature, dolichocephalic, and mesorrhine. Nambutris are below medium, dolichocephalic and mesorrhine.

On the whole, the people of Kerala are thus short or medium statured, long-headed, and with medium broad noses. Certain tribes and a few castes tend to have broad noses.

There is one interesting point to which attention should be drawn. Dr. B. S. Guha and Dr. W. R. Ehrenfels have both observed curly hair among the Kādar of Kerala. Sickle cells have also been observed in the blood of some populations here. It has been argued on the basis of the first observation that there is a remnant of a Negrito population in these regions, perhaps comparable to the Negrito population of the Andaman Islands. Dr. S. S. Sarkar and others have challenged this observation. They say that the west coast of India was subject to small infiltrations of people of African origin, and that may account for the negroid characteristics observed. Evidence of Negrito strain is, according to them, too meagre at present.

In Mysore, out of about 20 million people, the Scheduled Castes form 13·31% and the Scheduled Tribes 0·41%. Three classified data are available; these include one tribe, the Yeruva, and two communities, the Kodagu and Sidhi. The Sidhi are of African, probably Abyssinian origin.

The Yeruva are short in 64% cases; the head is dolichocephalic in 56% and the nose, chamaerrhine in 80%. The sample was of small size (25). The Kodagu (32) are of medium stature in 53·11%; the head is mesocephalic 56·25% and nose mesorrhine in 68·75%. The Sidhi sample of 100 shows some striking features 2% are very tall, 21% tall and 60% medium in stature. 9% are hyperdolichocephalic, 44% dolichocephalic, and 40% mesocephalic. 51% noses are chamaerrhine, 41% mesorrhine and 4% hyperchamaerrhine.

When we consider data of class II, tribes tend to be predominantly short, with a tendency among the Kuruba and Hattīkanā Kuruba towards medium stature. The head is dolichocephalic with a tendency towards mesocephaly among Kuruba, Hattīkanā Kuruba and Vettakuruba. The nose is chamaerrhine except among the Kuruba and Hattīkanā Kuruba.

Among castes, stature is on the whole medium, except among the Mukri (33) and Ager (34) who tend to be short. The head is, on the whole, mesocephalic. The Ager (34), Nāḍavara Bant (42) and Solaga (40) show dolichocephaly, while the Havik Brahmin (41), Gangadikāra Okkaliga (67), Gauḍa (56), Kodagu (100), Kuncitiga (27) and Paṭṭasālī (41) tend towards brachycephaly. Noses are mesorrhine, except among the Ager (34) and Solaga (40) who tend to be chamaerrhine.

Out of a total population of over 31 millions, the Scheduled Castes form 14·13% and the Scheduled Tribes 3·68%. Classified data only from three castes, Jälāri, Māla and Mādiga, and from one tribe, the Cencu, are available.

Andhra Pradesh Then Cencu (15) are medium statured, dolichocephalic and mesocephalic, and mesorrhine. Among the three castes over 50% are medium in stature. The Jälāri (50), an exception, are often short (48% cases). The head is dolichocephalic in over 40%, but among the Jälāri it is 48%. The nose is mesorrhine in over 60%.

The average values relate to 2 tribes and 6 castes. The tribes are medium in stature. The head is not dolichocephalic but mesocephalic among the Kāpu (100) and Boya (50). The nose however, is mesorrhine. Medium stature is predominant among castes, but the Padma Sālē (30) are short. The head is mesocephalic except among the Telugu Brahmins (50) who tend to be dolichocephalic. Komati (?) are dolichocephalic according to Guha and mesocephalic (50) according to Thurston. The nose is mesorrhine.

There is a large amount of classifiable data in South India obtainable from Ivanovski and Chakladar. In their sample of Hindus, the stature (6,423) is medium in 51% and short in 37%. The head (6,528) is dolichocephalic in 47% and mesocephalic in 36%. The nose (5,904) is mesorrhine in 70%.

Among the Tamil dealt with by the same authors, the stature (86) is medium in 58% and short in 29%. The head (149) is mesocephalic in 44% and dolichocephalic in 39%. The nose is mesorrhine in 76%.

### *Middle India*

Out of a population of nearly 15 millions in Orissa, the Scheduled Castes form 17·95% and the Scheduled Tribes 20·55%.

Orissa Four classified data are obtainable. Among them there are three tribes—the Juāng, Khond and Santāl—and one Scheduled Caste, the Nuliā.

The tribes are short, the Santāl (100) being medium with a high frequency of short stature. The head is dolichocephalic and the nose mesorrhine in over 60% caste. The Juāng (46) are chamaerrhine in 67% (and 10% hyperchamaerrhine) and the Santāl in 32%. Among the Nuliā (150), stature is medium in 48%, head dolichocephalic in 51% and nose mesorrhine in 66%.

When we consider data of class II, we find 10 tribes and 11 castes represented. Tribes are short, the exceptions being the Gond

(51) and Mundā (32) who are predominantly medium. The head is dolichocephalic, but mesocephalic in Bondo Porojā (46). The nose is often chamaerrhine. This is particularly so among the Koya (51), Porojā (52), Bondo Porojā (46), Savara (29), Bhuina (91) and others. Castes are predominantly medium in stature, dolichocephalic and mesorrhine.

In Madhya Pradesh, out of a population of over 26 millions, 15·01% are formed by the Scheduled Castes and 18·58% by the Scheduled Tribes.

Classified data are available for 9 tribes—the Baigā, Bison-horn Mariā, Hill Mariā and others. The stature is medium in 50% and short in 40%, while the Baigā (64) and Nahāl Madhya Pradesh (47) have short people in over 50% and medium in about 40%. The head is dolichocephalic in about 60% only among the Dhurwā (100) and Dorla (100); it is mesocephalic in about 45%. The nose is mesorrhine in nearly 60% and chamaerrhine in above 30% among the Bison-horn Mariā (50), Hill Mariā (100), Korkū (87), Kol (127) and Nahāl (47), and chamaerrhine in over 60% among the Baigā (18% hyperchamaerrhine), Dhurwā, Dorla and Gond (49).

Data of class II are available in the case of 9 tribes and 3 castes. Tribes are on the whole medium or short statured, Dandami Mariā (50), Dhakar (50), Gaḍabā (52), Halaba (51), Hill Kharīā (70) and Rautiyā (Kol) (95) belonging to the latter group. The head is dolichocephalic, the Halaba and Parja (50) being mostly mesocephal. The nose is mesorrhine, except among the Bhatra (54) and Hill Kharīā (70) who have more chamaerrhine individuals.

Among castes are represented Malve Brahmin (50), Baghel Rājput (50) and miscellaneous Rājputs (50). Their stature is medium; the head is dolichocephalic except among the Baghel Rājput who are mesocephalic. The nose is mesorrhine.

### *West India*

Out of a population of over 48 millions, which includes modern Gujarāt and Mahārāshtra, the Scheduled Castes form 10·78% and the Scheduled Tribes 7·75%. Classified data for Gujarāt are available for 13 castes like Nāgar Brahmin, Baniyā, Kāthī, Kolī, Kumbhār and Mocī, and one tribe, the Bhīl.

The Bhīl (180) are medium in stature in 58·4% cases, dolichocephalic in 56·7% cases and mesorrhine in 73·9% cases. Data regarding stature are not uniformly available for castes. Nāgar

Brahmin (100) and Baniyā (127) are medium in above 50% cases and short in 26% and 42% respectively. The head is mesocephalic in 50% and brachycephalic in over 30% cases. There are more than 45% brachycephals among Nāgar Brahmin (100), Kadwā-Kunbī (117), Kāthī (135), Leva-Kuṇbī (101), Mocī (54), and Rājput (113), while they have nearly 35% of mesocephals. The nose is mesorrhine in over 50% and leptorrhine in nearly 30%. The Kumbhār (53) have 43% leptorrhine and 34% mesorrhine.

Average values are available for 1 tribe, 16 castes and 5 communities like the Bhātiā, Baniyā-Jain, Pārsī, Khojā etc. The Macchi-Khārwā (141), a tribe, is short, mesocephalic and mesorrhine. Stature is medium among the castes, the Bhaṅgī (41) being short. The head is mesocephalic in general; but the Āyar (25), Bhādela (51) and Minā (50) are brachycephalic. The nose is mesorrhine on the whole, the exceptions being the leptorrhine Brahmakṣatri (31), Memon (110) and Rabāri (106).

Among communities, the Bhātiā (30) are medium statured, brachycephalic and mesorrhine. The Pārsī (137) are medium statured, brachycephalic and leptorrhine. The Baniyā-Jain (99), Oswāl Jain (100) and Khojā (103) are all medium statured, mesocephalic and mesorrhine.

For Mahārāshtra, classified data are available for 16 castes ranging from the Cītpāvan Brahmin to Mahār, two tribes, the Khāndēś Bhil and Kātkarī, and two communities, Mahārāshtra Beni-Israel and Pārsī. The Bhil (100) in question are medium in 61% with a fair percentage who are tall (20%). Heads are hyperdolichocephalic in 18%, dolichocephalic in 60% and mesocephalic in 22%. 44% are hyperchamaerrhine, 37% chamaerrhine, and 18% mesorrhine. The Kātkarī (100) are short in 50% and medium in 44%, dolichocephalic in 54%, mesocephalic in 39%; chamaerrhine in over 50% and hyperchamaerrhine in 10%.

Among castes, medium stature occurs in nearly 60% individuals, 25% being short. The Kunbī (100) are short in stature in above 50% and medium in 44%. High caste Marāthā (100) are tall in 36% and the Cītpāvan Brahmin (100) are tall in 22% cases. More than 40% are mesocephalic; while the percentage of brachycephals is as follows: Cītpāvan Brahmin 29%; Deśasth Brahmin (100) 25%; Mahār (100) 18%; high caste Marāthā 18%; Marāthā Ghāti (100) 35%; Prabhu (100) 52%; Sāraswat Brahmin (100) 35%; Kunbī 24%; Mādhyandin Brahmin (624) 15%; Son-Koli (100) 25%; Tāmbat Kāsār (59) 34%; Nāmdev Śimpī (100) 36%; Thākur (90) 35%. The nose is mesorrhine in over 60%. Among the Thākur nose is chamaerrhine in 65%.

The Pārsī sample is small (20) and they are brachycephalic in 25% and hyperbrachycephalic in 45% cases. The Beni-Israel (60) are medium statured in 57%, tall in 28%; mesocephalic in 45%, brachycephalic in 22%, and mesorrhine in 57% with a tendency towards leptorrhiny (41%).

When this is compared with the average values available for 60 castes, the picture is as follows: Stature is medium, a few like the Halbi (33), Kunbī Mana (26), Mahār Bawane (25) or Marāthā Lohār (15) having more short ones among them. The head is by and large mesocephalic; some like the Halbi or Kunbī Mana have more dolichocephals, while castes such as the Pāthāre Pra-bhu (33) or Pāthāre Kṣatriya (26) have more brachycephals among them. The nose is mesorrhine, except in the case of Khatri (26) who are leptorrhine; and Halbi, Kolī-Mahār (30), Korku (26), Kolām (30) and Bhilla Māvaci (58) are chamaerrhine.

### *North-western India*

Out of 16 million people in Rājasthān (1951), 15·67% belong to the Scheduled Castes and 11·11% to the Scheduled Tribes.

Classified data are available for the Bhil (56) and Rājasthān Pamar (65). The former are short in 52% and medium statured in 36% cases. The head is dolichocephalic in 50% and mesocephalic in 30%; the nose being mesorrhine in 62·6% and leptorrhine in 28·5% cases. The Pamar Rājput are tall in 30·7% and medium in 61·5% cases. The head is hyperdolichocephalic in 27·7% and dolichocephalic in 64·6%. The nose is leptorrhine in 27·7%, mesorrhine in 66·1% and chamaerrhine in 4·6%.

Of Punjab's population of over 16 millions, the Scheduled Castes form 21·64% and the Scheduled Tribes 0·02%. Classified data are available for castes like the Awāñ, Arorā, Punjab Gūjar, Khatri, Kulu Kānet, Lāhul Kānet, etc., and for one community the Sikhs.

Stature is tall in 30% and medium in 60%; Lāhul Kānet (30) are short or very short. The head is dolichocephalic in over 60%, the Lāhul Kānet being mesocephalic in 70% and dolichocephalic in 23% cases. Noses are mesorrhine in nearly 60%. Some like Gūjar (13) and Lāhul Kānet (30) are leptorrhine in over 50%.

The Sikhs of Punjab (156) are tall in 61·5% and medium in 32% cases; 6·4% cases are very tall. 24% are hyperdolichocephalic and 61% dolichocephalic. 63% are leptorrhine and 32% mesorrhine.

Out of Jammu and Kashmīr's 4 million people, 3·54% belong to the Scheduled Castes. Six classified data are available; of these, one is on the Pāṇḍit, one on Kulu Lāhulī, and the rest on Kashmīrī, Ladākhī, Muslim and Pahārī.

Jammu and Kashmīr  
The Pāṇḍit (206) are medium statured in 66·5%, 20% being short. The head (226) among the Pandit is hyperdolichocephalic in 8%, dolichocephalic in 64% and mesocephalic in 26%. Kulu Lāhulīs (27) are hyperdolichocephalic in 74% and dolichocephalic in 26% cases. The nose of the Pāṇḍit is leptorrhine in 82% cases.

Muslims (52) are medium in 48% and tall in 28·8% cases. 75% are dolichocephalic, 77% leptorrhine, and 15% hyperleptorrhine. Ladākhī (34) are medium in 61% and short in 29%. 62% are mesocephalic and the rest are dolichocephalic; they are mesorrhine in 42%, the rest sharing equally leptorrhine and chamaerrhine nose.

Average values for Kanawarī (54) indicate that they are medium, dolichocephal and leptorrhine.

### *North India*

20·72% of the Uttar Pradesh population of over 63 millions belong to the Scheduled Castes. 62 classified data are available, among which there are 3 tribes, namely Kaci, Lodhā <sup>Uttar Pradesh</sup> and Oraon; 16 upper castes and 37 lower castes. Moreover, 6 communities such as the Bhatū, Pathān, Shaikh etc., are also represented.

In general, the stature among high castes is medium in about 60% cases. The Rājput (520) however, are very tall in 1·2%, tall in 32·5%, medium in 55%. The Cauhān and Rathor, two important subgroups of Rājput, are about 30% tall and 60% medium in stature. Brahmin (243) are very tall in 1%, tall in 18% and medium in 63% cases. Baniyā (80) and Chatrī (239) are very tall in 1% and tall in about 15%; Babhan (26) and Kāyastha (125) are tall in 38% and 17% respectively. The head is hyperdolichocephalic in 25% and dolichocephalic in 60% cases. The nose is leptorrhine in over 30% and mesorrhine in over 50% cases. However, Baniyā and Kāyastha have about 25% chamaerrhine nose and 4% and 1% very broad nose respectively. Some communities like the Rājput have leptorrhine noses among 50% of the population.

Among lower castes, the stature is medium in 50%, and short stature occurs in over 30% cases. Some castes are extraordinary,

the Gūjar (50) are medium in 44% cases, tall in 41%, very tall in 8% and giants in 2% cases. Habru (149) are medium in 54%, tall in 21% and short in 22%. Dolichocephalic heads constitute the majority, being 60%, while 25% are hyperdolichocephalic. Bhatū (150) are also mesocephalic in 28%, brachycephalic in 3% and ultrabrachycephalic in 1%. Lower castes can be divided into two groups by the character of the nose. Aghariā (107), Ahīr (68), Camār (158), Koltā (42) and Thārū (254) are leptorrhine in 30% and mesorrhine in 60% cases. The other group formed by Barhi (33), Cero (100), Kewant (100), Kharwār (194) and others are leptorrhine in 5%, mesorrhine in about 60%, chamaerrhine in 30% and hyperchamaerrhine in 3% cases. Korwā (100), Kurmī (100) and Pāsi (100) are predominantly mesorrhine and chamaer- rhine.

Communities like the Jāt (52), Syed (33) and Shaikh (105) have been left out of this survey.

### *Eastern India*

Bihār's population of nearly 39 millions contains 12·67% Scheduled Castes and 10% Scheduled Tribes. 31 classified data Bihār are available, among which 16 are of tribes, 10 of "lower" castes and 5 "upper" castes.

Tribes are on the whole short in 60% and medium statured in 30% cases. Some, like Pahirā (80) are short in 68·7% or very short in 26·2%. The Santāl (300) and Oraon (100) are medium in 60% and short in above 30% cases. The Ho (122) are also medium in 47·5%, short in 45%, and tall in 6·5% cases; the Kharwār (100) are equally medium and short. The head is dolichocephalic in 55% and mesocephalic in 30% cases. The Khar- riā (78) have a small percentage of brachycephals and hyperbrachy- cephal. This is also true of the Ho and Oraon. The Pahirā (80) have 9% brachycephals and the Santāl (300) 5% of the same kind. The nose is mesorrhine in 60% and chamaerrhine in over 30% cases. The Bhumij (100), Kharīā, Korwā (21) and Kharwār (100) are predominantly chamaerrhine with a small percentage of hyper- chamaerrhine.

The so-called "lower" castes of Bihār are of medium or short stature. The head is dolichocephalic in over 50% and mesocephalic in over 30% cases. Goālā (100) and Maghayā Dom (100) have small percentages of brachycephals, including hyperbrachy- cephal. The nose is mesorrhine in over 50% and chamaerrhine in over 25% cases. Some, like the Musāhar (77), have 58%

chamaerrhine, 14% hyperchamaerrhine, and the Lohār (73) have 48% chamaerrhine, 12% hyperchamaerrhine.

The "higher" castes are either tall (30%) or medium (50%) in stature, excepting Sakadvīpī Brahmin (77), who are more medium and short; and Kanaujiā Brahmin (185) have 13% who are very tall. The head is dolichocephalic in 50% and mesocephalic in 40% cases. Some Brahmin and Rājput show a significant proportion of brachycephals and hyperbrachycephals. Thus, Bhūihār (348) have 11% + 1%, Maithil (243) 8% + 3% and Rājput (137) 10% + 1%. Noses are leptorrhine in 50% and mesorrhine in 40% cases. There are 14% chamaerrhine among the Rājput.

Data of class II, i.e., average values are obtainable for five "upper" castes. The general findings are similar. Stature is medium; the head is mesocephalic and nose leptorrhine, except among Kāyastha (75) who are mesorrhine.

West Bengal has a population of over 26 millions (1951). Out of this 18·03% is formed by the Scheduled Castes and 5·96% by the Scheduled Tribes. 57 classified data are available, West Bengal but part of this data belongs to what is now East Pākistān. We shall try to leave them out when they are recognizable, but in many cases this would not be possible. The general statement made here about physical characteristics will not, anyhow, be affected.

The tribes included in Bengal's measurements are either Mongoloid like the Lepchā, Khambū or Gāro or belong to the Mundārī group like the Santāl, Mālpāhāriyā, Māle or Lodhā. In general it can be said of both that in stature they are either short or medium with a few very short or tall.

The Mongoloid communities have heads which are predominantly mesocephalic and brachycephalic. Thus, the Lepchā (57) have 51% in the first category and 33% in the second, while 9% are hyperbrachycephalic. The Santāl (50), on the other hand, have 22% hyperdolichocephals, 36% dolichocephals and 32% mesocephals. Noses of the Mongoloid groups are predominantly mesorrhine, with a small percentage of leptorrhine. In contrast, the Mundārī-speaking groups are more chamaerrhine, with the next place occupied by mesorrhine. Santāls have even 15% who are hyperchamaerrhine. The Mālpāhāriyā (100) and Māle (100) show nearly the same characteristics with 60% under chamaerrhine and 25% under hyperchamaerrhine.

When we observe castes "lower" in status than Brahmin and Vaidya, the stature is medium and short, with a small percentage of tall. Some like the Bunā (200) or Noluā (200) are on the whole shorter. The figures for these two are short in over 75%.

medium in 15%, and very short in above 2%. *Baiśya* (73) are comparatively taller in stature; medium stature occurring in 45%, tall in 30%, short in 22%, and very short in 3%. The head may be said to be mesocephalic in the majority of cases. Dolichocephals are more numerous among these castes than brachycephals; while some like the *Rishi* (101) or *Śāṅkhārī* (136) have about 10% who are hyperdolichocephalic. It is interesting that some, like the *Rājbarnī* of Midnapore (500), show a high percentage of brachycephaly, including hyperbrachycephaly. The *Gandhabanik* (50) have similar proportions. The nose is mesorrhine in the majority (above 60%) and leptorrhine in about 25%. Castes like the *Śāṅkhabanik* (133) are leptorrhine in 66%, mesorrhine in 20% and chamaerrhine in 13%. In contrast, the *Bāgdi* (199) are mesorrhine in 65%, chamaerrhine in 26% and leptorrhine in 7% cases.

When we come to "higher" caste, the stature is medium in above 55%, tall in about 20% and short in above 15%. There are, of course, relative differences in these percentages between castes like the *Vārendra Brahmin* or *Dakṣin Rāṛhiya Kāyastha*; but they can be overlooked for the present purpose. The head in most cases is mesocephal (over 40%). This is followed closely by dolichocephals in the case of *Brahmin* (320) and *Kāyastha* (440) and then by brachycephals. The *Maithilī Brahmin* (50) are either dolichocephalic, hyperdolichocephalic or mesocephalic. In contrast, mesocephals are succeeded in numbers by brachycephals among the *Vaidya* (134), *Dakṣin Rāṛhiya Kāyastha* (72), *Dākṣinātya Vaidik Brahmin* (164) and *Rāṛhiya Brahmin* (380). There is evidently a strong percentage of brachycephaly among higher Bengal castes, as among some castes in Gujarat. The nose is leptorrhine in over 60% and mesorrhine in about 30%. Curiously, 28% chamaerrhines and 4% hyperchamaerrhines are present among the *Maithilī Brahmin*. Among some such as *Vaidya* or *Kāyastha*, mesorrhine noses are more numerous than leptorrhine.

Muslims (103) are medium in 47·6% and short in 42·7%, mesocephal in 47·6%, brachycephal in 27% and hyperbrachy in 8·7%, leptorrhine in 65% and mesorrhine in 32%.

Out of Assam's population of nearly 9 millions (1951), 4·69% are Scheduled Castes and 19·48% are Scheduled Tribes.

Classified data are available for 12 tribes like the Assam Arleng, Bodo, Khāsi, Gāro and others. They are medium in stature in over 50% cases and short in about 30%. The head is mesocephalic in 50% cases, but there are some interesting deviations. The *Koc* (88), Hill Gāro (100) and Plains Gāro (100) have dolichocephals in the following proportions:

60%, 53% and 47%. This is followed by high figures for mesocephaly, namely, 31%, 44% and 46%. Brachycephalic and hyperbrachycephalic heads are few, though among the Āhom (19) this rises to very high figure (31% + 26%). The Khāsi (237) and the Mī-shing (Miri) (25) have more than 16% brachycephals each; the latter have also hyperbrachycephaly in 8% cases. The nose is mesorrhine in over 60%. The percentage of chamaerrhine and hyperchamaerrhine is also fairly high among the Khāsi (25%, 2·5%) Koc (24%, 7%), Hill Gāro (46%, 4%), Mī-shing (Miri) (36%, 4%), Mande (Gāro) (62%, 35%), and Bodo (42%, 21%).

Classified data are available for the Pūrūm (60) and Thadou Kuki (120) in Manipur, for the Kaipeng (31), Riang (199) and Tiprā (71) in Tripura, and for 11 tribes in the North Manipur, Tripura, NEFA East Frontier Agency including the Nāgā, Āo & Nāgāland Nāgā and Angāmi Nāgā.

In general, one may say that the stature is short in over 50% cases and medium in 20%-30% cases. The head is mesocephalic in the majority; this is followed by dolichocephaly, as among the Pūrūm or the tribes of Tripura or the North East Frontier Agency. The Angāmi Nāgā have, however, 41·08% long heads. Brachycephaly occurs in a small percentage. It is 11% among the Pūrūm, 10% among the Thadou Kuki, 13·5% among Lhotā Nāgā (37) and 26·5% among the Angāmi Nāgā (185). Among the Āo-Nāgā (51), it occurs in 41·2%. The nose is mesorrhine in the majority of cases. This is succeeded by 41·6% of leptorrhine among the Pūrūm and 28% of chamaerrhine among the Thadou Kuki. The Konyāk Nāgā (22) and Lhotā Nāgā also have a fairly high percentage of chamaerrhine including hyperchamaerrhine.

The general picture which emerges from this account is as follows. The major portion of India seems to be inhabited by a medium statured, mesocephalic and dolichocephalic The overall mesorrhine population. This includes the Mediterranean and Palæ-Mediterranean. The population picture tends to have more dolichocephals in Peninsular India, while occasionally there is also some amount of brachycephaly, as in the extreme south. But samples are small, and it would be unfair to reach major conclusions on their basis. In the north, there is a frequency of leptorrhine among the "upper" castes; while among the "lower" and even some of the middle groups, noses are chamaerrhine. Among tribal populations in Mahārāshtra, or in Eastern India, the frequency of chamaerrhine is clearly high.

It is obvious that all over India there are now areas of a short to medium statured, dolichocephalic, chamaerrhine and mesorrhine population. This distinctive group has been given different names

by different authors. It is the "Dravidian" of Risley, "Niśāda" of Chanda, "Proto-Australoid" of Guha, "Pre-Dravidian" of Haddon, and "Veddid" of Eickstedt. It is likely that elements of the Scheduled Castes have had an infiltration from this population. The opinion has been expressed that this population covered the entire North Indian plain at one time. Remnants of Mundā affiliation have been discovered in the Western Himālayas as well (Konow, 1905); but there the affiliation is of language.

The north-western portion of the northern plains has a population distinct from the predominant Mediterranean and Palæ-Mediterranean stock. This is a tall dolichocephalic leptorrhine population which appears to be in progressively greater concentration as one proceeds through Punjab towards Afghānistān. Various castes in Uttar Pradesh, Bihār and Bengal, which occupy the upper ranks, show similar characteristics. This statement, however, is not true of all the upper castes. Some show a clear element of brachycephaly, or a mesocephaly which comes close to brachycephaly.

In parts of Gujarāt a brachycephalic, leptorrhine element is clearly numerous. Risley held that here brachycephaly was contributed by Scythian invaders, while in Bengal this was due to Mongoloid infiltration. As the hypothetical Mongoloids do not seem to have left traces of other characteristics like lank hair and high cheekbones, Risley's views have not found general acceptance. Haddon, as well as Chanda, suggested that this was due to a migration of brachycephalic Caucasoid (Alpinoid) people after the tall, long-headed leptorrhine population had occupied the northern plains.

In the Pamirs (or Hindu Kush) there is definite evidence of a round-headed population; and it is highly probable that this "Alpine" or "Alpo-Dinaric" also came in waves of migration to occupy the western and eastern outskirts of the northern plains. The distribution of the brachycephal element in middle India is not yet known with certainty.

In the north-eastern portion of India some Mongoloid tribes are predominantly round-headed, while another group is medium or long-headed. Hindu castes in Northern Bengal show clear traces of this infiltration. Tribes who were once outside Hindu society have found a place within it sometimes.

It may be added that the physical characters presented here in very broad terms have not remained quite unaltered. Some modification has undoubtedly taken place through changes in ways of life. Thus, nomads or hill people practising a form of shifting cultivation have settled down in valleys and plains as permanent

cultivators; and that has produced a measure of change in their physical characteristics. Alternations have also been due to inter-marriage. There are groups among the Mundā people, for instance, who are known by such names as Khangar-Mundā and Oraon-Mundā. Who knows if castes have always been as strictly endogamous as they appear to be? It is not quite unlikely that, within the Hindu population of India, changes over and above those caused by environmental influences were brought about by intermarriage.

## *2. Cultural Development*

Culture, in Anthropology, is a term almost synonymous with civilization. In general usage, the term civilization stands for the products of the mind which are distinctive of a particular community—the higher forms of thought, the creative arts. While culture, in the anthropological sense, does include these ways of self-expression, it is also deeply concerned with the material arts of life, the productive organization along with the attendant social arrangements by means of which the common needs of existence are met.

Even a casual survey of Indian life and civilization reveals the fact that a kind of uniformity or even unity prevails all over India in respect of philosophical thinking as also the ideals of social organization. But there is great diversity in food, dress, habitations, means of transport and agricultural methods; and that gives colour and attractiveness to Indian rural life. Here we shall briefly outline this diversity and indicate where it has an inner core of unity.

An outstanding fact about India's cultural history has been that even in the remotest past India never became isolated from other countries. Some kind of contact was always maintained over thousands of years. Though there has been no detailed research on the Stone Age in India, it is known that certain tools used in this country in the Palaeolithic period have a striking resemblance with those of East and South Africa on the one hand, and Java on the other. Again, the tools of a certain industry made mostly of flakes have been tentatively identified in India; that seems to indicate kinship with a Chinese and Burman industry of about the same date. Later, in the Neolithic period, a closer relationship between Eastern India and some of the peninsulas of South East Asia seems to have developed.

Language forms one of the main elements in a people's cultural life. India has two broad linguistic families. The Indo-Aryan

family of languages lies roughly north of latitude 18°N. while the Dravidian languages are spoken south of this line. Another Elements of family of languages represented by Mundārī, Santālī, cultural unity Juāng and others lies interspersed over both these major regions.

But man does not live by language alone. If we observe the food habits of the people, and those arts which are likely to have been invented long before man attained a high degree of civilization, the dividing line in India will seem to differ from that laid down by language. One can presume that the techniques of pottery-making, basketry, the way cereals are eaten (just boiled in water or ground into flour and baked), the methods adopted for pressing oil out of seeds, and the ritualistic associations which cling to certain varieties of food, all go back to a more distant past than the date of diffusion of India's numerous languages or dialects. In some parts of India pottery is still manufactured without the use of a wheel; oil is expelled simply by pressing seeds between two thick planks of wood; casting of brass is done by the lost-wax process; iron is extracted in small waist-high earthen blast furnaces. It is interesting to note that some of these culture elements of Eastern India can be traced in discontinuous distribution across political boundaries, among communities living in Northern Burma and even as far east and south as Indonesia.

These material arts of life indicate that proof of India's cultural kinship can be obtained not only from the history of her languages, but also from objects which are transmitted from one community to another as a result of slow, peaceful contact.

Plans of villages in India, the form of rural dwellings, the grains that are cultivated, and even the function of agricultural implements may have something to do with factors like climate and soil. But the manner in which cereals are cooked, or the way some kinds of food are treated as sacred and others as defiling, is not a matter which is determined by geographical conditions. Certain traditions may have originated in answer to the demands of adaptation; but when customs are perpetuated irrespective of probable needs, when they acquire prestige value, they become non-adaptive elements whose history does not have to be traced to geographical causation.

Recent investigations in India have been concerned with what are known in Anthropology as culture areas. It appears that the Culture areas occupied by distinct languages are not coterminous with the culture areas which are slowly emerging out of these investigations.

For instance, Mahārāshtra has a language belonging to the

Indo-Aryan family. The principal food there is wheat or millet. This is ground into flour and unleavened flat bread is prepared. Oil is the villager's source of fat, sesamum being the most common seed used. In many parts of Mahārāshtra, the oil-press has disappeared as a result of industrial competition; but where it is still in use, a curious thing has been observed. In the whole of Northern India, oil-presses have a channel through which oil trickles out as the seeds are pressed. In the south, on the other hand, the presses have generally no outlet for the oil; after expulsion the mortar is removed and the oil ladled out and eventually wiped off with rags tied to the end of a stick. In some parts of Mahārāshtra, the northern oil-press with an outlet has recently been introduced by the All-India Village Industries Association. But elsewhere, the southern oil-press is still in vogue. It is interesting, however, that when the northern type is used, the channel is plugged first. After the seeds have been sufficiently pressed, the plug is removed and the oil drained out. The operation is thus of the southern type, even though the new instrument is derived from the North.

It is thus held that cultural relationship may be based not merely on linguistic affinities but on other things equally important in a people's life. Further, in the context of affinities other than linguistic, Assam, Bengal and Orissa appear to have come closer to Andhra Pradesh or Madras than to Uttar Pradesh or Punjab, although in the matter of language Orissa, Bengal and Assam belong to the Indo-Aryan family and not to the south. The exact dividing line is still obscure. When separate culture items are indicated on a map showing distribution, there is frequent overlapping. But it is significant that the dividing line does not run east and west as in the case of language; it runs irregularly and obliquely from north-east to south-west.

There is yet another field in which the history of cultural development can be traced with a comparatively fair measure of accuracy. This is the field of art and architecture.

**Temple types** If we trace the history of Hindu temples, we find that in the early Middle Ages, from the seventh to the ninth centuries A.D. India was already marked into distinctive parts on the basis of temple types. There was roughly a northern as well as a southern form. Not that the forms were exclusive. There were frequent contacts between the two regions; common elements can be traced in decoration and mouldings, as well as in the nature of ground-plans.

In later times, there was perhaps more of local specialization. However, Central India, North-western Rājasthān, western regions

like Gujarāt and even a part of Karnātaka developed more likenesses between themselves than with parts of Eastern India, such as Bengal. They began to develop peculiarities of their own in regard to the form and internal structure of temples. At the same time, the Tamil-speaking areas developed a distinctiveness which marked them off from Karnātaka in the west and Andhra Pradesh and Orissa in the north.

Yet, in spite of local differentiation, the underlying ideas that guided the symbolic meaning of temple-forms were common between the North and the South. The significance of images continued to be subject to the same ideals as before, though the artistic traditions under which these were executed differed widely.

All this would mean that languages and crafts spread in India in a way that was partly independent of the manner in which basic arts like agriculture and pottery and fine arts like architecture were diffused. One may hope that after methodical investigations it will be possible to arrange these cultural diffusions in their proper sequence.

One fact emerges out of the investigations conducted so far, and that relates to a feature which persistently occurs in the cultural history of the land. It would normally be assumed that, when two arts of life serving the same end come into a kind of competitive relationship, the one that is technically at a lower level of efficiency will tend to disappear. That, at least, is the development which would normally be anticipated in view of what is happening all around in our competitive world. But in India, curiously, various forms of both efficient and inefficient production are permitted as it were to continue side by side.

The social mechanism built up in order to carry on the organization of production supplies a probable answer to this state of affairs. The mechanism is the well known one of caste. Caste was not wholly an economic structure. Yet, undeniably, it was built up on the basis of monopolistic guilds which were endogamous; each of these guilds grew into a separate caste.

The arrangements made for the exchange of goods and services in India's highly stratified society were a deliberate process. And it is of interest to observe that a system of compromises was built up at the level of ideas which gave an additional stability to the economic substructure. In course of time, one caste split into two or more in accordance with industrial specialization. Simultaneously, tribe after tribe was brought under the economic dominance of this system. Each group was assigned a rough kind of monopoly in some occupation. Each was allowed to preserve

its specific characteristics of culture so long as these did not come into direct conflict with the sovereign ideas professed by the Brahminical priesthood. Brahmin priests went on extending their sway over the sheltered communities and tried to bring about a uniformity of rites and practices, while local or family customs were permitted to continue after minor modification.

Material traits have a fairly wide range of variation in India. But when we compare this with differences in the social organization connected with production, the range of variation seems more restricted. The North and the South may differ in language, food, and forms of bullock-carts or oil-presses. But both approximate closely to a common social model.

Castes are governed by their own organization of authority. In many parts of India, particularly in the North, political and economic changes have destroyed caste's ancient manner of managing internal local affairs. But where ruin has not overtaken the system, there appears to be a greater similarity between Northern and Peninsular forms of organization than, for instance, in the field of material traits.

Curiously enough, a greater uniformity has been retained at the economic level of caste than perhaps in relation to customs regulating marriage in particular. Marriage is as important in life as food. Yet, while the North and the South were on the whole subject to the same laws of inheritance and succession, and while common Vedic rituals were practised, especially among the upper castes, a larger measure of deviation was permitted in regard to customs regulating the choice of mates.

All over India arranged marriages are regarded as respectable. There are prescriptive and prohibitive rules about the choice of mates. One rule sharply distinguishes the upper castes of the North from the South: cross-cousin marriage is a common practice in the South in contrast to the North. Again, among some southern castes a man may marry his elder sister's daughter, while this is not the practice anywhere in the North. Behind these customs there is the purpose to retain property within a limited circle of kinsmen. That, however, is not the only way in which the purpose can be achieved. Yet, such customs, marking off one part of India from another, must have persisted for nearly 2,000 years. Books of law or secular literature dating back to the early centuries of the Christian era refer to these customs in the South.

One prevailing characteristic of Indian civilization has been the principle of allowing diversities to remain, and this has strongly influenced the cultural evolution. Those who occupied low

positions in a stratified society did not feel the urge to rise in revolt against inequality. The reasons were twofold. First, each Diversities allowed to coexist socially distinct inbreeding group occupying a particular rank in the caste system had a sense of security, because of the rule of monopoly which all the other communities respected. Secondly, the attitude of "live and let live" satisfied all the groups emotionally; cultural freedom was thereby assured to all, provided there was no conflict with the Brahminical moral code.

This democratic attitude towards different ideals and forms made a strong impact on the cultural development of the land. Hindu philosophical thinking reached the conclusion that no way of life was built upon a realization of the "whole truth". All ways were based on part-truths, and they did not have to give way to one another so long as they were not static or did not come into violent conflict with one another.

This principle of continuous progress in the quality of living experience, and the need of the coexistence of various beliefs suited to individual needs, led to interesting results, as in the field of iconography. In Indian iconography a variety of syncretistic images have been produced through a long period of time. Images of Śiva and Pārvatī, and of Viṣṇu and Śiva joined into one, have been more common than syncretisms between Buddhist and Hindu images. Buddhism started as a protestant movement against Hindu orthodoxy and ritual. Later, the Buddha himself found a place in the Hindu pantheon as an incarnation of Viṣṇu. Elements of Buddhist thought are believed to have been incorporated by Saṅkara in his Advaita system from the philosophical speculations of Nāgārjuna. There may have been occasional conflicts at the sectarian level in ancient or medieval India; but they cannot be compared with the clashes between Roman Catholicism and Protestantism in Europe or between Shi'ah and Sunnī in the Muslim world.

The spirit of toleration in the supreme thought-systems and religious beliefs of various communities gave Indian civilization an unexampled resilience when it came in contact with alien communities. It is significant that the attitude is shared by various sects born on the Indian soil. Broadly speaking, all India shares certain ideas in common, while social organization shows some variation and material traits marking off one geographical area from another show a larger range of variation.

The success of this civilization was indeed remarkable. India accumulated great wealth through her industrial organization based on a satisfied group of monopolistic guilds. Cultural tolerance led

to intellectual freedom. Those who wanted to make the fullest use of that freedom could do so by surrendering the rights which accrued to them from citizenship: taking to the life of *sannyāsin*, they could be released formally from their previous social obligations. The exploration of higher reaches of thought in India was mostly the work of *sannyāsins* or near-*sannyāsins*.

Under this civilization, India as a land of fabulous wealth attracted not only Pathān and Turki adventurers from neighbouring countries but also explorers and merchants from the European world.

Pathāns and Turks first entered India for plunder, but some remained to found kingdoms. The general rural system of production does not seem to have been violently disrupted.

**The impact of aliens** New towns and administrative centres connected with fortresses grew up at strategic points. New forms of land management were introduced; a class of soldiers thriving on land rent granted in exchange for services arose. New arts and crafts were introduced. But life in the villages went on as before, except when a territory was subjected to political disturbance. The times were occasionally stormy. The general arrangements for production however, were not violently altered from the form they had attained in course of centuries of sequestered growth.

One result was that, in rural India, the poorer and down-trodden castes of peasants and artisans who accepted conversion to Islām continued to regard their hereditary occupations as high and low, a characteristic of the caste system. This was particularly marked in East Bengal, where Jola (Julāhā) converts to Islām continued to weave coarse textiles, Kulus pressed oil and Nikaris traded in fish.

A striking development was the catholicity that now appeared in Hindu religious thought. Significantly, a new *Upaniṣad*, entitled *Allah Upaniṣad*, was composed at one time. The **Cultural fusion** ideal of social equality and an uncompromising form of monotheism began to take root in the Indian soil.

Sect after sect grew up in the late medieval ages under the influence of saints like Guru Nānak and Kabīr, so that a happy blending was effected between a resurgent form of Hindu theism and Islāmic social equality.

The mutual reactions of Hindu and Islāmic cultures became particularly fruitful in the world of painting and music. In both these fields enrichment came out of a new delight in the beauties of nature, and a recognition of the value of human love in a form which had been absent in earlier Hindu art. It may be pointed out that these contributions were due not so much to the austere

religion of Islām as to the culture of Irān with which the Muslim courts were permeated.

The development of culture after Muslim influence was introduced into India did not always follow the path of synthesis. Hindu society had suffered politically; but its economic and productive organization still remained more or less unimpaired. The catholicity of Hinduism was for many more attractive than the rigid monotheism of Islām, or the cultural exclusiveness into which Islām in India eventually drifted for purposes of self-defence. Moreover, Islām had no substitute for the mutual security associated with the caste system.

A revival of Hinduism consequently took place, leading to a kind of puritanic reformation. In Bengal the movement is associated with the name of Caitanya, the great Vaiṣṇava reformer. Under Raghunandan's influence religious practice became more stringent and rites of atonement were prescribed for those who departed from customary observance. Laxity must have begun to prevail, so that drastic remedies were needed for internal purification.

To sum up: After the Hindus in Northern India had lost political power, on the one hand the infiltration of Islāmic ideas led either to conversion or to the creation of synthetic creeds; and on the other, Hinduism recoiled upon itself and lost its earlier resilience.

India's cultural development took a new turn after contact with the Western world. This contact has brought about a progressively accentuated reorganization of the productive arrangements. In the past, production was geared mainly to local needs. Towns were comparatively few. The road system was inadequately developed. With the consolidation of the British power in India, steamships and railways brought about a great change. Production in agriculture adapted itself to the requirements of distant or even overseas trade. Several home industries could not face the challenge of factory production. Masses of men left their hereditary occupation to drift into agriculture or industry. The obligations which held communities together were progressively lost, so that individuals were released for absorption into the new economic system.

One immediate result of this reorganization was the growth of new towns. Village after village became fused with its neighbour to give rise to towns, even though loyalties were not yet fully oriented towards the demands of common civic existence. With selective migration to the new towns, villages became progressively depleted of much of their traditional leadership.

**The new forces**

Changes in the productive organization are naturally accompanied by changes in social and cultural life. But it is perhaps necessary at this stage to indicate that different parts of India have been unequally affected economically by the new forces, so that social and cultural changes have also been unequal in different regions.

Due to a series of historical accidents, British influence in India became located first in Bengal. Significantly, a strong leadership arose in that Province and decided that life should henceforth be aligned with the new forces rather than with the old. Later, similar changes came in other parts of India. A brief indication of developments in Bengal may serve as a sample of what has been happening in the rest of the country.

The series of influences to which Bengal was subjected were not autogenic in character; indeed, they were traumatic. But the decision about the acceptance of Western social and cultural concepts helped to strengthen values which had lain dormant within Indian civilization for a long time past. Some of the best and most progressive minds in Bengal became fully identified with Westernism even in the early stages of its impact. There were many conversions to Christianity. Then followed a new sense of nationalism. Eyes turned to India's cultural heritage. There was an intense desire to regain from the past whatever might serve the needs of contemporary life.

Much of the learning of the past had hitherto been locked up in the Sanskrit language, and the usual form of literary expression both in Sanskrit and the "vernaculars" was in verse. This learning now began to be brought to the common reader through the medium of prose translation. One of the gifts of Western contact was the printing press. This was widely utilized to meet the demands of progress.

Simple books on science and articles dealing with natural history and mechanical inventions became equally popular with tales from the literature of the past. Although an appeal to the past was often made in the struggle to bring about social reform, some of the dominant values in terms of which the past was represented were themselves derived from values which had come in the wake of the politically dominant West.

The Brāhma Samāj in Bengal, for instance, was one of the early expressions of national revival. But it preached a form of Hinduism from which polytheistic elements had been discarded, and which was close to the monotheism of Islām or Christianity. The organization of the Church under the Sādhāraṇ Brāhma Samāj, as also of services

Synthesis  
with the old

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performed there, approximated closely to the practices of the Church of England. There was nothing wrong in the introduction of such innovations. It is only necessary for us to note that social and cultural change was often guided by an inward acceptance of the newly introduced values although the outer garment in which these were clothed happened to have been derived from the past as well as the more familiar.

The Brâhma Samâj, however, did not depart from some of the fundamentals of Hinduism. It stood for an eclecticism whose roots undoubtedly went back to Hindu origins. There was no compromise at the level of idolatrous practice, but the windows of the Church were thrown open to all that was acceptable in the region of thought or religious experience.

A parallel illustration can be drawn from contemporary domestic architecture in Bengal. During the first overwhelming impact of Western culture, the dwelling houses of the poor remained more or less as before. But the new houses of the rich closely followed European designs. Houses are meant for living; and if the modes of living of two communities are not the same, their houses have to be different. Accordingly, adaptations began to be made. Venetian shutters, decorative mouldings and cornices, and composite pillars derived from Gothic churches were added from time to time for utility as well as decoration. Sometimes, the outer apartments of a house and even its interior furnishings were after the European model, while the inner apartments where the women of the household led their secluded life kept on to the old local design. In still later times, when nationalism began to play an increasingly important role, houses whose form had become European were decorated with ornamental elements derived from temples and other structures of pre-British India. In other words, the divided alliances working in the minds of men influenced architecture, as it influenced many other things.

The outcome was nowhere more vivid than in the field of literature. Bankim Chandra Chatterjee was a pioneer in many respects. He reformed Bengali prose; and while he introduced many ideas from Western philosophers such as Comte, he recast earlier Hindu thinking in terms of the needs of modern times. Bankim Chandra translated the *Bhagavad-Gîtâ* into Bengali prose and wrote a life of the legendary hero of the *Mahâbhârata*, Śrî Kṛṣṇa; both the works were characterized more by the new spirit of humanism and rationalism than by older values. Yet, in spite of this leaning towards European thought, Bankim Chandra kept closer to his Hindu heritage than some of his contemporaries.

Perhaps this was responsible for his partial unpopularity with the Westernists, and for his influence on a later generation which was stirred by the spirit of nationalism.

The fertilization of Indian thought, and of Indian culture in general, which began in the yearly nineteenth century, has not yet run its full course. A large part of India's social heritage has survived from the past. Since the demands of modern life are frequently thwarted by Revaluation of values ancient forms of organization, or an attachment to values which are of doubtful utility today, the struggle goes on between the forces of "progress" and of "conservatism" in India's contemporary cultural life. Item after item from the distant past, or even from the folk-culture of hitherto neglected or forgotten communities, is being held up either for acceptance or rejection. There is a demand before the Indian mind to examine and re-examine all such values. As Indian culture becomes comparatively free from the disturbed state in which it is today, it will attain emotional and intellectual maturity and contribute to the enrichment of human life as a whole.

### *3. Tribal People and Their Life*

The communities classified by the Government of India as the Scheduled Tribes numbered over 19 millions, in the Census of 1951. This was 5·35% of the population of India at that time. It is difficult to determine the exact number of individually distinct communities, since the same tribe may bear slightly variant names in the States under which they are enumerated in the official list. Yet, perhaps it would not be wrong to place this figure at 22·6 millions.

When the Scheduled Tribes are split up in terms of occupation, it is observed that 90·64% are dependent on agriculture and the rest on other forms of labour. Table I is based on the Census Report of 1951.

Communities which depend on agriculture do not obviously live in isolation. Many of their needs are met by artisans, traders or money-lenders, as in the case of others who do not belong to the scheduled groups. It would perhaps be useful to begin an account of tribal life with a classification of the various ways in which such communities make their living.

The Jarawa and the inhabitants of the Sentinel Island in the Andamans are two of the most isolated tribes of India. Both live

TABLE I

*Scheduled Tribes (1951)*

(Figures in brackets indicate percentages)

	Agricultural classes				Non-agricultural classes				Total (V to VIII)
	Cultivators of land wholly or mainly <i>owned</i> and their dependants	Cultivators and their dependants <i>unowned</i> and their dependants	Non- cultivating agricultural labourers and their dependants	Total	Production other than cultivation	Commerce	Transport	Other services and mis- cellaneous services	
I	II	III	IV	(I to IV)	V	VI	VII	VIII	
12,543,014	1,873,821	2,803,171	64,254	17,284,260	764,984	123,641	62,554	871,243	1,822,422
(65·64)	(9·8)	(14·67)	(0·34)	(90·46)	(4·00)	(0·65)	(0·33)	(4·56)	(9·54)

Note :— The table does not include figures for Ajmer, for which no break-up in different classes is given in the Census Tables.  
 Total (All-India) = 19,116,498 — 9,816 (Ajmer) = 19,106,682 (all agricultural classes and non-agricultural classes).

by hunting, fishing and collecting wild produce from the jungle. Formerly they used no iron but tipped their arrows or spears with sharpened pieces of bone or broken bits of stone.

**Forest-dwellers** Now the Jarawa at least secure iron or glass from the settlers in the Andamans by means of stealth.

The Andamanese do not know how to make fire, although they use it for various purposes and maintain it with great care. The Onge of the Little Andaman are a similar people; and from what is known about them, one can guess that the number of Jarawa or Sentinelese cannot be far from three hundred each; it may indeed be less.

Let us turn from these completely isolated communities to other dwellers of the forests. The Birhor, Mallār and Khariā of Bihār and Orissa, the Kādar of Kerala or the Cencu of Andhra Pradesh live in small, nomadic or semi-nomadic bands. They gather wild leaves, roots and fruits, manufacture ropes from wild creepers, and collect honey or beeswax for personal use or for exchange with agricultural produce. Such tribes are neither isolated nor independent. Their economic pursuits are in complementary relationship with those of their neighbours. The total number of these forest-dwellers does not perhaps exceed a few thousand.

A much larger number of tribes who dwell in hills and forests are comparatively more independent. Tribes who belong to this category live in more or less well-defined areas where

**Shifting cultivation**

people from the plains have not yet penetrated.

Their settlements are comparatively permanent; but the fields where crops are grown are not the same from year to year. A clearance is made in the jungle with axe and fire, and seeds sown without tilling the soil. One piece of land is used for two or three years when successively different crops are sown, and then it is abandoned for a new clearance made elsewhere. For instance, a particular family among the Juāng of Orissa sows in a particular year sesamum in the newly cleared field, rice in the second year's and a poor form of millet in the third year's clearance. A clearance made three years before is abandoned.

Few tribes in India today are wholly dependent on the produce of this form of slash-and-burn type of cultivation. A part of their annual requirement of food may be supplied in this manner; but in a large number of cases, specialized crops like pulses, cotton or sesamum are raised for cash sale. In some instances again, as among the Savaras of Southern Orissa, a field is treated in the above manner only for some years. If the slope of the ground is favourable, the hill-side is terraced with great labour and water drawn from streams for irrigation. Then the field is permanently cultivated with the aid of cattle and plough.

It is difficult to estimate the total number of persons dependent on shifting cultivation, wholly or in part. The amount of land under such occupation is also uncertain. If we rely upon the few, inexact measurements made, we can perhaps hazard the opinion that no more than 4 or 6 persons per square kilometre in the rain-drenched eastern corner of India are generally supported by this form of cultivation. In one instance, the land in use was not measured; but figures were obtained by questioning the heads of families. A rough estimate can also be made from the quantity of seeds sown. All this worked out to nearly 20 or more persons per square kilometre of used land. But this leaves out the total area of hills and jungles which the community considered to be its own, and within which it would not brook any trespass.

The tribes apart from those engaged in such inefficient methods of production are not readily distinguishable from the masses of India's vast agricultural population. They have languages and social customs of their own; otherwise, they are about the same as the other people. For instance, the Santal of Eastern India is hardly distinguishable from his Hindu neighbour except in the sense that he may prefer a particular type of soil or slope of the ground for his fields or settlements. Tribal folk who are employed as labourers in forests, mines or factories are not different in any way from other communities in the same profession.

It should be pointed out that even when following the same profession as their neighbours, the Scheduled Tribes often have an inferior social status; and they are ruthlessly exploited by their employers and by money-lenders. The latter take full advantage of the tribesmen's ignorance or sense of trust and their general habit of honouring a debt. The contact of these people with Hindu farmers, traders and money-lenders has increased of late because of the penetration of roads and railways into secluded areas. Some of the tribesmen have felt attracted by Hinduism; others have retired into more inaccessible forests so that they may live in their own way. The reciprocal economic relationship has anyhow brought about a certain measure of give-and-take. Many instances may be cited in which tribal ways of life have given place to Hindu ways. The Hindus in their turn have incorporated things of more humble origin into their composite body of religious and artistic traditions.

We may now pass on to some of the elements of tribal culture which are distinctive. It would be better to present a few illustrative examples rather than make generalizations. One may begin with the land management system prevailing among the Mundas of Chota Nagpur. In the past, when a new settlement

had to be founded, members of a family marked the selected spot by building fires at each of its four corners. All the land within these limits was then occupied by the kin-group; it was distributed among individual members for clearance and tillage, and the full enjoyment of the produce of their labour. But there was no right of transfer or sale. The kin-group redistributed land whenever necessary. This kind of land tenure has been known as the *Khuntkatti* system.

The *Khuntkatti* system  
The system  
Such a system is suitable when a forest is first cleared. But it cannot encourage intensive farming. The Mundās may have known that Hindus held land individually, worked hard for its improvement and passed it on to their sons as inheritance. Or, they may have arrived at the idea that personal ownership was more helpful in agriculture than the primitive form which vested ownership in a body of kin. In any case, by 1912, not more than 1·4% of the total area of Rānchi District, for instance, was still under the *Khuntkatti* form of tenure.

When a tribe lives by shifting cultivation, land is naturally managed in a different way. The Juāng and Savara of Orissa practise shifting cultivation within village boundaries which are roughly defined, but which seem to be recognized and respected by the inhabitants of other villages. If there is trespass, the aggrieved party pelts the culprit with stones. Elders from several villages are called and they settle the dispute. When a dispute is purely local and internal, the tribes depend on organizations which are of more limited dimension.

Among the Juāng inhabiting the central plateau of Keonjhar District where dependence is on shifting cultivation, a village is inhabited by men belonging to the same clan. There is village exogamy because clans are exogamous. Disputes are placed before elders of the clan who are the same as village elders. When, however, the tribe changes its way of life and takes to plough cultivation in permanent fields, the community grows in size and several clans settle down to form a many-clanned village. Even then, each clan tries to restrict itself to contiguous huts in the village so that its solidarity may be preserved as far as possible. In such villages, the territorial, non-clan assembly may function when the interests of the village as a whole are involved. In lesser matters, the clans may continue to exercise their former authority.

Tribal communities have retained their own way of managing internal affairs. And their way differs from that of their Hindu neighbours who are divided into castes. The contrast becomes clearer when we examine certain other types of organization prevalent in the tribal world of India.

The Nāgā or the Adi, inhabiting the north-eastern corner of India, are warlike people. They live in stockaded villages under the rule of chieftains who lead the community in war. Most of these tribes practise cultivation in terraced fields on the hill-sides, and leadership in peace vests in the group which leads in war. Such instances are not very numerous in the country. Most tribes manage their affairs by means of institutions which are more intimately concerned with the simpler joys and sorrows of everyday life. And, of course, some of these institutions are not present in the more complex society of their neighbours.

One such institution is the bachelors' dormitory which is present in one form or another in Assam, the North East

Bachelors' dormitory      Frontier Agency, Nāgāland, and parts of Bihār, Orissa, Andhra Pradesh and Madhya Pradesh.

Bachelors, and sometimes maids also, have a dormitory of their own; there they spend the nights and a good part of the day. The institution functions as a club. But often it also functions as a school where the youths are initiated into tribal tradition and the art of community living. In some instances, the youths receive their first lesson in the mysteries of sex as members of their own dormitory.

These clubs have frequently another duty to perform. If a person is unable to look after his fields, or if help is needed in house-building or in connection with some social ceremony, youths take upon themselves the responsibility of giving the required aid. It is also not unlikely that, when there is an onslaught on the village from hostile neighbours, the first responsibility of defence falls upon the members of the dormitory. Among the warlike tribes of North-eastern India, the bachelors' dormitory functions as the militia of the village. Indeed, many youths continue to be members of the club even after marriage, when they have set up a separate home.

Now that inter-tribal warfare is no longer in vogue within the boundaries of India, the bachelors' dormitory restricts itself to certain picturesque forms of activity. The Oraons of Chota Nāgpur have an annual communal celebration in which villagers from all over the country gather with their local flags and engage in a competitive display of dances. Members of each bachelors' dormitory carry their flag as representatives of the village. Occasionally, quarrels break out and the youths do not hesitate either to take life or lay down their own in defence of their honour.

Territorial solidarity in tribal villages is strengthened by institutions of this kind. There are also other means of achieving the same result. The Santāls in Bengal and Bihār have an annual

gathering during spring-time for a communal hunt. All the men living in a certain area assemble and move through the jungle with implements in hand. Such a festive gathering spread over several days creates a deep sense of unity among the men of the tribe. This is further strengthened by bringing up for decision cases in which the tribe happens to be interested at the time. The elders also make this an occasion when changes in established usages are recommended for general acceptance.

The lineage or clan, as a form of organization, is no less important. Among the Ho or Mundā, the clan has a more vital role than *gotra* among the Hindus. In life and in death a Ho belongs to the clan of his fathers. When a man dies, his body may be cremated or buried, but some of his bones are collected in a small earthen vessel and interred under a large flag-stone in the clan ossuary. The country-side in Chota Nāgpur has numerous ossuaries of this kind; they are marked by horizontal or vertical slabs cut and transported at a great expense of human labour. It may be that there are no members of the tribe living within miles from an ossuary; but a man hopes that, after his death, his bones will be carried by loving hands to rest with the bones of his forefathers. And that will be an occasion for a great festive gathering.

Bonds with the past are strengthened in another way. Tribes like the Juāng, Mundā and Santāl believe that the world is peopled not only by the living but also by the hovering spirits of the dead. Within the area of a store-room in a Mundā or Ho cottage, there is a sacred spot where the departed ancestors are supposed to have their residence. The Juāng mark the spot with pieces of stone, grains of rice, and coloured powder. The spirits are supposed to retain their personal likes and dislikes even after death. So, a few leaves of tobacco may be laid on the door-sill in memory of an ancestor who had a special fancy for it in his lifetime.

This attention bestowed on the departed serves to bridge the gulf between the living and the dead. A person does not feel lonely or lost in a friendless world; surrounding him on all sides are souls tied to him by bonds of kinship and therefore interested in his welfare. However, an ancestral spirit may become unfriendly if proper attention is not paid to him.

Institutions which serve to maintain a feeling of continuity between the present and the past are not restricted to India's tribal world. Hindus, too, share the feeling. That applies also to the Chinese and Japanese. There are variations in the specific institutions by means of which this continuity is achieved.

Certain other institutions are intended to bring together the tribal communities and their Hindu neighbours. The Dussehra festival of Bastar (Madhya Pradesh) is an example.

**Ritual and art** There, people of many tribes and castes assemble for worship. Colourful ritual helps to strengthen the

feeling of oneness between neighbouring communities. This leads us to the question of the place of ritual and of art in tribal life. India's artistic traditions are well known. The art of tribal India cannot be said to be of a high order, but then it would be unfair to compare tribal or folk art with classical art. The point of distinction is that classical forms are usually the concern of specialists, while the common man or woman contributes to folk art in a free way.

Tribal art enters into many different aspects of life. The Juāng, Savara and Khond carve the door with traditional designs, or in imitation of things which they consider beautiful. Their combs are also done into lovely shapes. Santāl women decorate their house-walls in pretty colour and paint figures of animals, birds and flowers. Basketry and textiles offer opportunities of artistic creation. The way a tribesman wears a garment or head-dress or a woman wears flowers in her hair is in itself an expression of art. Indeed, the life of tribal communities, though full of stark poverty, is copiously enriched in this way.

When a tribe lives in comparative freedom and in close relationship with nature, its sense of joy finds outlet in such ways as music and dancing. The music of tribal India, as it is accompanied by dances in which both men and women, young and old, participate, carries true emotional appeal. On the whole, life is more free and joyous among the tribes than among members of the same economic class in Hindu society.

The tribal folk have their sorrows, apart from those due to productive inefficiency and economic exploitation. They are obsessed by certain fears, the product of a philosophy which impinges on the simple problems of existence.

**The supernatural** There is the belief, for instance, that everything in life is subject to the control of supernatural forces. If a child falls ill, the father may take recourse to herbal remedies which an experienced neighbour may suggest. The Santāls have accumulated a good number of remedies by empirical methods, and some of them have an undoubted therapeutic value. But the main reliance is on the medicine-man. He finds out by "magic" the unseen cause of a disease and prescribes a sacrifice or offering to a particular god or dissatisfied spirit—the illness is then likely to be called back.

This trust in the supernatural and reliance on the dumb signs of nature for counsel is a strong characteristic of most tribal cultures in India. When the Juāng of Orissa have to select a new site for a settlement, the village priest digs a hole, goes through a form of worship, and leaves a chicken in the hole overnight, under a basket. If the bird is found dead the following morning, the Juāng will avoid the site for the gods do not want him to live there. When the crops fail, it is due not to natural causes but to someone who has cast an evil eye. The causes of many ills are ascertained either by divination or through men who go into a trance and are in communion with an unseen world.

The dependence on the supernatural, and an implied admission of man's helplessness and the futility of trusting to reason marks the behaviour of most tribal people when they are confronted by a crisis. The magic of witchcraft may even lead to crime. When, through supernatural manifestations, guilt is fixed on a man or woman, murder may follow. Such crimes have now become rare, but even their occasional occurrence is suggestive.

What is happening to tribal people and their life in India today? It may be said that the changes to which these communities are subject are mainly of three kinds. Some are due to movements from within. Although the stresses to which a tribe is subject may be caused by forces from outside, the direction of change is largely determined by internal leadership. Some changes are due to external, voluntary agencies working for the uplift of the tribal people. A series of changes may be brought about through laws or protective policies initiated by the Government.

Excellent accounts of social change effected through religious movements are available in such works as *The Mundas and Their Country* and *Oraon Religion and Customs* by Sarat Chandra Roy. Roy has described in detail the rise of the Tana Bhagat, Kabirpanthī, Kurukh-Dharam and other sects, as well as the operation of Christian influences on tribal life in Chota Nāgpur. In some of these instances, the transition to Hinduism took place in a simple straight manner. In others, men and women went into a trance, or had dreams or visions in course of which they were ordered to forsake meat and wine and lead an ascetic life. On an analysis of the elements introduced by the Birsa Movement in Rānchi, the Tana Bhagat Movement of Lohārdagā or the similar Rājmohini Devi Movement of Madhya Pradesh, it becomes evident that the elements of culture which are supernaturally recommended are mostly derived from contemporary reform movements within Hinduism itself, or, in a few rare instances, from Christian contacts.

The general trend in autogenic or spontaneous movements is towards Hinduism, and the line of reform brings the tribes closer to one dominant idea prevalent in Hindu tradition, namely, that the sorrows of life can be overcome by purity and asceticism. This leads the tribes away from the openly joyous, predominantly optimistic attitude with which they generally face some of the problems of life.

One social consequence of this kind of Hinduization is that it often leads to divisions which begin to limit marriage to their own group. In a few instances, where marriage has not yet been debarred, a daughter who has been given in marriage to an "unreformed" family is not allowed to cook or serve rice to her parents when on a visit to her old home. Tribal society thus absorbs something of caste and the beliefs of the tribe are re-oriented in terms of Hinduism.

The influence of Christian missions on tribal communities has been of a different kind. Conversion to Christianity gives an individual a status and dignity which he does not gain under Hinduism. Christian churches have also encouraged medical relief, and technical and other forms of education.

Before India's independence, many educated tribal converts to Christianity tried to align themselves with the British ruling class. The estrangement between these Christian converts and their neighbours became deepened as the struggle for freedom gained in intensity. The situation has changed since independence; all the more, since the Christian Churches have now become oriented towards Indian culture.

It has been the policy of the Government of India to promote education and throw open new avenues of employment to all the Scheduled Tribes. Those who live by hunting, collecting or shifting cultivation are encouraged to settle down as permanent cultivators. Schools have been established for technical and literary education. Hostels have been opened where tribal and non-tribal boys live together. Such schemes have been too recent for a full assessment of their results.

One notable effect of the educational progress is an increasing desire among certain sections of the tribal people to remain distinct and separate from their Hindu neighbours. Some leaders of the Santals, for instance, have been experimenting with a newly-invented script designed for languages like Santali, Mundari, Ho and others, while many books in these languages are printed in Bengali, Devanagari or Roman script. The swing was formerly towards a slow process of Hinduization; the current tendency seems to be one towards a kind of "nationalistic" revival. And it is interesting

that while a constant evolution and reinstatement of tribal culture takes place, certain picturesque customs like the dance of men and women together are given up because the Hindus look askance at them. There seems to be an ambivalent attitude towards the values current in Hindu society; some are inwardly accepted, even while there is an idealization of the tribe's ancient culture.

#### 4. *Population*

The United Nations Demographic Yearbook 1960, estimated a total world population of 2,907 millions for the year 1959. On the assumption of a round figure of 3,000 millions for 1961 and an inhabited land area of 135·16 million square kilometres for the world, India accounts for about 2·4 per cent of the world's land area and 14·6 per cent of its population. As a single country, India holds the second place in the world, the population of the People's Republic of China in 1959 having been estimated at 605·697 millions. But if one were thinking of the Indian subcontinent comprising India and Pākistān, its population would not be very far behind that of China, while in respect of persons per unit of area, this subcontinent would be quite as densely populated as any other comparable area in the world.

What is more significant, however, is the recent rapid rate of growth in this subcontinent. Pākistān has registered a rate of increase of about 2·36 per cent per annum during 1951-61, India closely following with 2·15. With a total population of 533 millions in 1961 (439 for India and 94 for Pākistān), this subcontinent may, therefore, along with the People's Republic of China, be regarded as holding the key to the world's demographic growth. In short, the rate of growth of population in these two areas will be a dominant factor in the world's population growth.

The population of India at the Census of 1961 was 439·234 millions. The census of the new Union Territory of Dādra and

*Growth of population* Nagar Haveli, taken in February, 1962, has been included, while a Portuguese census, conducted on 15 December 1960, estimated the population of Goa, Damān and Diu at 626,667 (589,997 for Goa, 22,390 for Damān and 14,280 for Diu) which, too, has been included in the above total.

Table II (p. 325) gives the growth of India's population since 1901.

TABLE II

*Population of India at each census, 1901-61, showing decennial per cent variations*

Year	Population	Decennial per cent variation
1901	238,396,327	
1911	252,093,390	+5·75
1921	251,321,213	-0·31
1931	278,977,238	+11·00
1941	318,660,580	+14·22
1951	361,088,090	+13·31
1961	439,234,771	+21·51

NOTE :— In working out decennial percentage variations for 1941-51 and 1951-61 for India, the populations of the following areas have not been taken into consideration:—

- (i) The 1951 population of the Tuensang District of Nāga hills and Tuensang Area (Nāgāland) i.e., 7,025 has not been taken into account for 1941-51 as this area was censused for the first time in 1951.
- (ii) The 1961 populations of the North East Frontier Agency (336,558) and Tuensang District (134,275) of Nāga hills and Tuensang Area (Nāgāland), have not been taken into account for 1951-61 as there are no comparable figures for 1951.

The magnitude of the increase in the last decade is readily appreciated when one reflects that, with a diminution of over 950,000 square kilometres of territory as a result of the Partition, India more than made up for the population of Pākistān (75·8 millions in 1951, three years and a half after August, 1947) which she had lost on the eve of her independence. One also notes that what is impressive is not so much the rate of increase, which up till now has never been inordinately high, and for past decades even quite low, but the large absolute increments. The Census Commissioner for 1951 aptly called 1921 the great divide, while the last decade may be viewed as a great leap forward. For, the actual count in 1961 surpassed even the most generous of expectations, having exceeded by more than 8 millions the highest estimate ever made before the census. These estimates possibly failed to project the cumulative effects of the elimination of recurrent famines, epidemics and pandemic malaria—these had carved up the country as it were between themselves in two distinct regions. A malaria map of India, reproduced in the All-India Census Report for 1941, must come as a shock to those to whom the era of famines and malaria is already a fading memory, for it describes the whole of North and Central India together with the thick spine of the Deccan plateau down to the northern tip of Tiruchchirāpalli as subject to recurrent malaria, while whatever was left east of this tract, from the easternmost point to the extreme west and

from the northernmost point to the extreme south, was in the grip of an endemic scourge. What was more, the tracts of recurrent malaria were almost contiguous to those of recurrent famines and epidemics and experienced recurrent crises in population growth between 1881 and 1931. It is no accident that it is roughly this tract, formerly ravaged by both epidemic and scarcity, with recurrent bursts of famine, that has shown the highest reaches of increase in 1951-61 (21 to 30 per cent) for already in 1941-61 it had shown a growth rate approaching 2 per cent per year. A much lower rate of increase (up to 20 per cent) is noticeable in the central and eastern tracts, the northern irrigation and the southern coastal belts, formerly in the endemic malaria and cholera zones of varying intensity and therefore subject to spates of recurrent crises, relative stagnation or variable increase between 1881 and 1931. It is possible that this latter area will attain still higher rates of growth before showing a decline.

Whereas in the sixty years 1901-61, India's population has increased by more than 84 per cent, the first twenty years (1901-21) saw a net growth of only 5·42 per cent, the next twenty (1921-41) of 26·79 per cent on 1921, and the next twenty (1941-61) of 37·84 per cent on 1941, while the decade 1951-61 alone has shown an increase of 21·51 per cent on 1951. As against the growth rate of 5·42 per cent in 1901-21, the extent of increase in 1921-51 and in 1921-61 was as much as 43·68 and 74·77 per cent respectively of the 1921 population. At this rate it seems likely that India will double her population of 1901 well before the end of the decade. Thus, while India's population was almost stationary in 1901-21, increases in subsequent decades were beyond anything previously experienced, while that for 1951-61 can well be described as phenomenal.

Appendix I (p. 349) gives the ranking of the States and Union Territories in order of population and area. Already in 1951 the Registrar General indicated that the population of North-west India in the thirty-year period of 1921-51 was increasing at the fastest rate, closely followed by West and South India, while the population of North (Uttar Pradesh), East and Central India was growing by only two-thirds or less of the rates of the former regions. This trend continued in 1961 in North-west, North (Uttar Pradesh) and West India, and even South India with the exception of Madras and, perhaps, Andhra Pradesh. Central India, freed from malaria and scarcity, has shown remarkable increase, caused, no doubt, in considerable measure by immigration from East Pākistān.

Even as there are areas of high density where a greater proportion of the population is concentrated in a comparatively small proportion of area, there are well marked areas of high rates of increase that are generally higher than the average for India. For example, the region of highest density, excepting for Kerala, is still the Indus-Yamuna-Ganga Doābs and the West Bengal basin. Stemming from the narrow strip of Gurdāspur, Amritsar, Jullundur and Ludhiāna in the north-west, the broad belt of Uttar Pradesh merges with North Bihār and finally with West Bengal, the density in the entire region being seldom below 200 per square kilometre and often above 400 in spacious bands astride the river. The central and Deccan plateaus, delineated by Mohindergarh (Punjab) in the north to the Nilgiris (Madras) in the south. Santāl Parganas in the east and the Arabian Sea in the west, are well under a density of 200 in the entire territory, except for the Districts of Ahmadābād, Kaira, Baroda and Surat in Gujarāt, Greater Bombay and Kolhāpur in Mahārāshtra, Hyderābād, Guntūr, Krishna, West Godāvari and Srikākulam in Andhra Pradesh and Bangalore in Mysore. Within this territory again, there are three large continuous areas with still lower density (all below 80 per square kilometre), that may be described as the western desert and lowlands, the Madhya Pradesh teak and scrub forests and south-eastern hill and upland forests. The first consists of the desert Districts of Rājasthān (bounded by Gangānagar in north, Sirohi in the south, Nāgaur in the east and Jaisalmer in the west) and the lowland Districts of Kutch and Surendranagar of Gujarāt. The second and central area starts with Tonk of Rājasthān in the north-west and embracing Chitor-garh, Būndi and Kota of Rājasthān stretches across the northern, central and eastern Districts of Madhya Pradesh. The third area straddles four States and covers Ādilābād (Andhra Pradesh), Chānda (Mahārāshtra), Bastar (Madhya Pradesh) and Koraput, Kālahandi and Baudh-Khondmāls (Orissa). Appendix II (p. 350) gives for each State the proportion of population related to proportion of area in different density ranges. It also shows how although the proportions for India as a whole are well distributed, there are frequent extremes in peaks and troughs.

Appendix III (p. 352) relates the States and the number of Districts in each which registered more than 21 per cent increase during 1951-61, with their respective densities in 1961, and illustrates how the highest increases have generally occurred in areas of low density.

The State of Jammu and Kashmīr has been omitted from this statement because no census was taken in 1951. It will appear that

176 (or 58 per cent) Districts out of a total of 303 in fourteen States have registered an increase of above 21 per cent in the decade. Out of these 176 as many as 130 have densities below 200, of which 43 have less than 80 per square kilometre, 47 between 80 and 120 and 40 between 120 and 200. In as many as 65 Districts with densities below 200, the population has increased by 21 to 25 per cent during the decade, while 34 Districts have increased by 26 to 30 per cent, and 31 more by over 30 per cent. This means that except for 46 Districts which have either had high densities from before and a few more which have seen fresh colonization in rural areas (e.g., Bastar in Madhya Pradesh) or a sudden onrush of migrants into new industrial areas (e.g., Bhilai in Durg) during the decade, spectacular increases have occurred mostly in sparsely populated rural areas and not in such high density areas as the Indus-Yamuna-Ganga valley, the coastal areas of Andhra Pradesh or the State of Madras. Then again, out of the 46 Districts of high density, increases beyond the average for India are in some due either to immigration (at least 2 in Assam and 9 in West Bengal) or accelerated urban increase (Indore in Madhya Pradesh, Kolhapur in Mahārāshtra, Ludhiāna, Ambāla, Rohtak and Gurgaon in Punjab, Āgra, Etāwah and Kānpur in Uttar Pradesh, and Burdwan, Hooghly, Howrah and the 24-Parganas in West Bengal). All this confirms the view that rural areas previously in the thrall of scarcity or epidemics are now having high spurts of population increase.

The statement further suggests that, although areas of high increase are fairly distributed all over the country, yet there are appreciable variations in the rates of growth among zones and States and even among well-defined areas within a State. The picture is more a mosaic than of a uniform tone. Thus one would have expected Kerala with her high literacy and pressure of population to have grown at a lower rate, as apparently has happened in Madras. The low rate of the latter further suggests appreciable migration to various parts of India, Tamil labour being in the habit of migrating by whole families even for seasonal construction work. Increases during the decade in 11 out of 15 major States, and more spectacularly in the Union Territories, may pardonably conjure up a picture of a basin rapidly filling up, not only in the depressions like Gujarāt, Madhya Pradesh, Orissa or Rājasthān, but even in the rim, like Assam, West Bengal, Kerala, Mahārāshtra and Punjab. The increase in Assam beyond the average for India may be reasonably explained by immigration of labour into plantations, mines, oil areas, railway projects and road projects as well as

immigration of both communities from East Pākistān. The increase in West Bengal may similarly be explained by the acknowledged influx of displaced persons from East Pākistān, Tibet, Nepāl and other places, by the exceptional increase of population in centres of railway and communicational expansion, in the expanding industrial centres around Asansol and Calcutta, in the newly established industrial and multipurpose project centres like Asansol, Durgāpur, D.V.C. and Mayūrākshi basins, all of which have attracted immigrants from outside, and the steady and appreciable perennial trickle of immigrants into the Calcutta Industrial Region. A preliminary examination of the 1961 Census figures of East Pākistān suggests that about 3 million persons may have left that country during 1951-61, mostly for West Bengal, Assam and Tripura, which accounts for part of the extraordinary increases in the latter areas.

The answer to the high population increase over the last four decades is not far to seek. In 1881 the Census Actuary computed a birth rate of 50·5 per thousand for Bombay, 47·9 for Bengal and 50·80 for the Central Provinces and effective death rates of 42·5, 39·9 and 42·8 for the general population. He estimated expectation of life at birth at 23·67 for males and 25·58 for females (24·63 for general). In 1891 the rates did not show any marked change, the overall figures for India being a birth rate of 48·8 and a death rate of 39·6, expectation of life at birth for males being 24·59 and for females 25·54. In 1911 the birth rate for the Indian British Provinces taken together was still estimated at 51·3 and the death rate at 43·1, while the expectation of life at birth had decreased to 22·59 for males and 23·31 for females from 23·63 and 23·96 respectively in 1901. In 1921, as a result of minor epidemics culminating in the great influenza epidemic of 1918, the birth and death rates stood very close to each other at 49·2 and 48·6. These rates diminished to 46·4, 45·2 and 39·9 for births and 36·3, 31·2 and 27·4 for deaths in 1931, 1941 and 1951 respectively. The expectation of life at birth in 1931 was estimated at 26·91 for males and 26·56 for females; for 1951 the corresponding figures were 32·45 and 31·66. The calibration of Vital Statistics and age-sex information collected at the 1961 Census shows that the birth rate during 1951-61 was still around 41 per thousand of population while the death rate was around 22 or still lower, for there is little doubt that the rate of natural increase has been steadily accelerating from year to year. Although the current infant mortality rate is still quite high, the expectation of life at birth in 1961 would be about 42. In other words over the

*The rising  
expectation of  
life*

last decade the expectation of life must have increased by just under a year every year.

All this means that although our agriculture is still greatly dependent on rainfall, a vastly improved network of intelligence and communication together with wise anticipation and laying by of reserves and buffer stocks has banished the scourge of famine which took its last heavy toll even as late as 1943. The Government has also put a stop to internecine strife and banditry, which, along with the disappearance of famine and scarcity, has reduced nomadism or homeless wandering and encouraged settlement and growth in sparse areas. The control of epidemic diseases has made rapid strides since 1918. While plague is now practically a thing of the past, cholera and smallpox, though quickly contained wherever detected, render our hold on the death rate still rather tenuous. Malaria, which up to 1948 constituted the major public health problem in India from the point of view of both morbidity and mortality, began to give way around 1950 and crumple up in 1954. A massive BCG campaign has attacked tuberculosis, but the lack of protected potable water and deficiency of protective foods render the population peculiarly vulnerable to cold and exposure and undermining attacks of diarrhoea, dysentery and typhoid. There is a large group of intermediate illnesses called dietary diseases, one variant of which, nutritional diarrhoea, frequently takes heavy toll of adult lives, while another, which may be called weanling diarrhoea, takes heavy toll of infants from 8 or 9 months to about 2 years of age, and pushes up the mortality rate at age 1 to a startlingly high figure. It seems, therefore, that the country has won only the spectacular half of the battle, viz., reclaiming the population from the jaws of death. The other, slow, dogged, undramatic half still remains: the battle of nutritional deficiency and vulnerability to disease. In short, although our mortality is low by former standards, our morbidity is nevertheless distressingly high.

How precarious the improvement in our survival still is can be judged from our steadily decreasing sex ratio (females per 1,000 males) from 1901 to 1961. Barring Kerala where the proportion of females to males slowly but steadily improved until 1951, and Punjab and Rājasthān where a fluctuating ratio may have been due to emigration of males to other parts of India, every other major State has registered a slow decline. In former decades famines, epidemics and even internecine strife and outlawry tended to be selective of males of specific age groups, although it is difficult to say whether this selectiveness was more in the reporting than real. As a result, selective survival at certain ages

would disturb the age structure of the population. But from now on, unless there is a change in the fertility pattern, a mere reduction in mortality will still keep the age structure and sex ratio at the various ages on an even keel. The deteriorating sex ratio reflects on our social health, for it indicates that the risk to female lives at most ages has not improved upon that to male lives; on the contrary, it seems to emphasize that demographically we have not yet entered upon the modern industrial age with its complementary characteristics of increased risks to male and reduced risks to female lives. Rather, we seem to be on the reverse as the Table at Appendix IV (p. 353) will bear out. Even allowing for the argument that the differences between the male and female rates are so slight that they may be attributed wholly to defective age returns or computational errors, the fact remains that at each successive census the enumeration of females and their ages have, if anything, improved rather than worsened. Whatever the reason, the prospects of survival of females seem to have been ever so slightly better before 1921 than after. While the risk of male deaths at most ages seems to have steadily decreased, especially after 1921, there has been no corresponding improvement in female deaths. In the first place, it is often contended, without much evidence of course, that masculinity at birth obtains to a greater extent in India than elsewhere. Secondly, girls, in the first few years of their life, still seem to suffer from greater neglect than boys, as a result of which nature's balancing action of taking away more boys than girls in the first years of life does not properly come into play, and the survival of girls never seems to draw even with that of boys. Thirdly, a heavy toll of female lives is taken in the earlier period of the reproductive age, that is, between the ages of 15 and 34. The toll is so heavy that the difference between the male and female population grows remarkably rapid and wide and this gap is never made up in middle or old age. What is more, proportionately greater deaths occur among females even between the ages 35 and 54 than is commonly believed. All these factors help to widen the male lead at birth with age, which our still modest expectation of life does not give much of a chance to narrow. The following extracts from the Actuarial Reports of 1881 and 1911 will therefore come as a shock to a person who would like to believe that it has been always like this before.

A comparison of the results given for the two sexes will show that female life in India, as in England, is, on the whole, better than male life. The mortality in the first few years is considerably less, during middle of life, it is somewhat more and again, after about age 40 it falls below the male mortality. The average duration of female life is considerably

greater than that of males at birth but falls below from age 4 to age 21 after which female life is better than male to the close of the table.

(*Actuarial Report for 1881*, para 232)

The expectations for female lives in all India are only slightly higher than for male lives, at all ages, the excess being 0.72 years at birth, diminishing to 0.11 at age 60; whilst in England, the superior expectation of female lives is 3.98 years at birth and 1.43 at age 60.

(*Actuarial Report for 1911*, para 246)

Another interesting feature of our sex ratio is its uneven distribution throughout the country, so much so that there are distinct tracts of particular ranges cutting across political and administrative boundaries and forming their own regions. Thus, for example, there are recognizable geographical bands where there are more than 1,000 females per 1,000 males. This is reflected also in the sex ratio of urban areas in the North and the South. Variations in sex ratio are not entirely explained by male selective migration. While very few towns (not certainly cities) in the North have their sex ratio anywhere near par, there are a few towns or even cities in the South, especially in the States of Andhra Pradesh, Mysore, Kerala and Madras where the sex ratio even drops much below 900 females per 1,000 males. This is a matter of great sociological interest to urban planning in India.

Let us have a brief look at the age structure of the population. India's age composition lends support to the widely held view that

the age ratios of a country with a fairly constant birth rate remain fairly stable regardless of the fluctuations in the death rate. Ratios of population of selected age groups to total population over the last sixty years are given in Appendix V (p. 354). The twin phenomenon of rising expectation of life and a stable age structure has certain obvious implications. A substantial gain in years of working life which a longer span of life offers does not necessarily imply a commensurate economic benefit. Much depends on whether such a decline in mortality is accompanied by a similar decline in fertility, since it is the latter, rather than the former, that primarily determines a population's age structure and hence the relationship between groups, which are likely to be producers and those which are likely to be dependents. One can draw an illustration from the Philippines. Calculations for the Philippines for 1954 and 1977 suggest "that with no decline in fertility but any increase in life expectancy of, say, 7.5 years, the expectancy in working life will go up by 5 years. At the same time male dependency will rise from about 103 to 107, thus putting more burden on the person who is already working to sustain a sizable family." The rise in the proportions at age 0-14 and ages above 59 of our

population in 1961 suggests similar problems confronting India, not to speak of the compulsion of increasing outlays on child health and maternity services and on primary school education at the expense of higher or technical and vocational education, and the diversion of scarce resources of trained manpower from productive activity to teaching jobs and numerous other infructuous branches of national expenditure.

This brief account of India's population would be incomplete without mention of one of its most important social and cultural characteristics: the mother tongue. The number of Mother tongue mother tongues returned in the Indian census runs to several hundreds. The Constitution lists fourteen languages in the Eighth Schedule. Appendix VI (pp. 355-56) gives, on the basis of the 1961 Census, Statewise population figures in respect of these languages, and Appendix VII (p. 357) the proportion of persons speaking them within each State.

While the general rate of increase during 1951-61 has been 21·51 per cent, that of the rural population has been less, and of the urban population more, than this figure. Following the inauguration of the Five Year Plans and the reorganization of States in the last decade, it was considered desirable, on the eve of the 1961 Census, to apply a few uniform tests throughout the country for defining places which could be considered as towns. It was necessary, first, to fix the number of places which could be regarded as possessing urban characteristics as distinct from swollen villages, and, secondly, to start a base line to determine India's growth of urban population in the future, particularly in the context of our Five Year Plans. The application of these tests disqualified 803 places with a total population of 4·386 millions and reckoned as towns in 1951 from being regarded as towns in 1961, as they did not possess predominantly non-agricultural, urban characteristics. On the other hand, 497 places with a total population of 4·807 millions which were not towns in 1951 were treated as towns in 1961, as they exhibited the qualifying characteristics. Although the urban population in the Census of 1951 was estimated at 62·444 millions, the true figure according to the 1961 definition would be 62·444 less 4·386 or 58·058 millions. The urban population for 1961 is 78·937 inclusive of 4·807 millions added for the new towns in 1961. Thus, the comparable decennial increase in urban population is really 78·937 less 58·058 or 20·879 millions, the reason being that the towns newly added in 1961 did not obviously have urban or non-agricultural characteristics in 1951 and may be considered as mainly the product of urbanizing

Rural and  
urban growth  
rates

forces set in motion in the last ten years, while those which have been eliminated in 1961 have justified their exclusion by having failed to develop non-agricultural and urban characteristics. So the real increase in the last ten years has been 35·96 per cent or about twice that of the rural population (18·90).

This figure of 35·96 per cent, high as it is, falls in between the 1931-41 and 1941-51 rates of 31·97 and 41·43 per cent respectively, and has, therefore, belied the widely held belief that the rate of urban increase in the last decade would exceed all previous records. Again, it is the absolute increase in the rural population with its very large base which has held the rural-urban ratio of population almost constant during the last ten years.

Accordingly, at the 1951 Census, while the number of cities and towns was reckoned at 3,060, that in 1961 was reduced to 2,700. In spite of the decrease in the number of towns, the total urban population of 1951, estimated at 62,443,934 for the 3,060 towns, increased to 78,936,603 in 2,700 towns. There was thus an increase of 16·493 millions in the urban population despite the elimination of more than 300 places formerly regarded as towns. The Indian census grades urban areas into six classes according to population. Table III (p. 335) gives the distribution of the urban population among the six classes and compares the number of cities and towns in each class with that of 1951. It will be remembered that the differences are due mainly to four causes: movement of a town of a particular class to a different class; elevation of a formerly rural area to a township in 1961; elimination in 1961 of places regarded as towns in 1951; and amalgamation of a number of satellite towns with big towns.

Space will not permit an elaborate discussion of the phenomenon of urban growth. But one cannot help observing that even if none of the 1961 Census towns were eliminated, the rate of urban growth during 1951-61 would still have belied the widely held expectations of unprecedented increase. In fact, even if the 1951 Census towns had all been retained, the resultant population would just have fitted the historic trend of urban rates between 1931 and 1951, whereas what was expected was a sudden sharp rise during 1951-61. Brief mention has been made later in this section of the outlay of the First and Second Five Year Plans in the various sectors of the economy, which will help partly to explain the pattern of urban growth. It is significant that about two-thirds of the decennial increase in urban population have occurred in cities of more than 100,000. Eighteen per cent of the urban population live in cities of over 1 million, 27 per cent in cities of between 100,000

TABLE III

*Number and population of towns in 1951 and 1961*

Class	1961 Census		1951 Census		Increase(+) in number of towns	Increase(+) in population of class
	Number	Total population	Number	Total population		
Class I (Over 100,000)	107	35,123,940	76	23,729,758	+31	+11,394,182
Class II (50,000-99,999)	139	9,529,812	111	7,624,667	+28	+1,905,145
Class III (20,000-49,999)	518	15,749,144	374	11,114,671	+144	+4,634,473
Class IV (10,000-19,999)	820	11,300,075	675	9,379,101	+145	+1,920,974
Class V (5,000-9,999)	848	6,343,670	1,195	8,510,277	-347	-2,166,607
Class VI (Under 5,000)	268	889,962	629	2,085,460	-361	-1,195,498
Total	2,700	78,936,603	3,060	62,443,934	-360	+16,492,669

NOTE:—In the case of Jammu and Kashmīr towns which have continued as towns during 1941 and 1961, have been treated as towns in 1951. 7 towns of 1941 which do not appear as towns in 1961 have been treated as deleted in 1951. The 1951 population is the arithmetic mean of the population of 1941 and 1961 of the continuing towns.

and 1 million, 12 per cent in towns of 50,000 to 100,000, 20 per cent in towns of 20,000 to 49,999, 14 per cent in towns of 10,000 to 19,999, and 9 per cent in towns of less than 10,000. This implies that these large centres are still expanding in industrial and commercial activity, claiming at the same time a comparatively large share in construction activities, public amenities and transport services. But the remarkable growth of Class I cities also indicates their capacity to absorb fresh investments, thus blocking their more equitable dispersal among the smaller towns. Of 107 places regarded as Class I, only 7 have populations of more than one million each and account for a total of 14,232,513 persons.

These seven cities are: Greater Bombay, Calcutta, Delhi, Madras, Hyderābād, Ahmadābād and Bangalore. During the last decade, these seven places alone have had an increment of 3,388,989 persons on their 1951 total, which means that they alone have claimed a substantial portion of the decennial increase in Class I, indicating thereby a further concentration of the country's investments. But the looming dominance of primate cities, regarded by some demographers as a sign of backwardness, seems to have been broken, particularly in view of the increments in the number and population of Class III and Class II towns. It may be noted in passing that Class III (20,000-49,999) has in 1961 accounted for an increase in 144 places with a corresponding share of more than 28 per cent of the net urban increase during the decade.

The reasons for this not more than the usual rate of urban increase are many. In the first place, an analysis of the plan outlays would not encourage larger expectations. Secondly, incomes of local bodies governing towns and cities have not generally measured up to the investment that would be required for providing amenities to attract large populations from the country-side. Thirdly, except for a few notable exceptions where housing activity has been more than rewarded by increases in population, the investment in construction and housing in cities and towns has not been of a high order. This is indirectly corroborated by the fall in urban sex ratio throughout India, except in Class I cities (100,000+) as a whole, and more notably in Class I cities in Mahārāshtra, Punjab, Uttar Pradesh, West Bengal and Delhi. The ratio has fallen not only in the North, but also in the Peninsula, traditionally a high sex ratio stronghold. There would be other contributory factors, such as the natural growth of urban population having a first claim on new jobs which thus reduces the "pull" of towns, the dissemination of Agricultural Extension Service, a general improvement in crop production and irrigation, extension of electricity to rural areas, success of the Community Development and National Extension Service programmes, the investments in small scale industries, khadi and village industries, handicrafts, handloom, sericulture, coir and special agricultural commodities, and the general improvement in plantations, fisheries, orchards, mines and quarries, transport in rural areas, and rural trade and commerce. It would be remembered that it was the Second Plan which aimed at stimulating fresh industrial activity, while the First Plan mainly directed its attention to bringing existing capacity to full working order. At the same time, much of the investment in the First Plan was directed not towards urban areas but towards the country-side.

There were 567,351 inhabited villages at the Census of 1961. These were mostly survey villages as defined in revenue records and not rural communities or hamlets, the number of which would be very much more. The total rural population was estimated at 360·298 millions, the average sex ratio in rural areas being 963 females per 1,000 males, against the urban ratio of 845. Table IV below gives the proportion of the rural population according to the size of villages, and also the sex ratio, for the whole of India.

TABLE IV

*Distribution of rural population by size of villages, 1961*

Size class of villages	Proportion of villages	Proportion of rural population	Females per 1,000 males
Villages with population :			
1. Less than 200	3,145 <sup>*</sup>	495	959
2. 200—499	3,059	1,600	962
3. 500—999	2,101	2,329	961
4. 1,000—1,999	1,153	2,486	962
5. 2,000—4,999	468	2,129	962
6. 5,000—9,999	60	620	973
7. Above 10,000	14	341	993
Total	10,000	10,000	

It is curious that only about 5 per cent of the rural population live in 31 per cent of all villages, while a little more than 64 per cent live in a little over 63 per cent of all villages. The 2,000-4,999 size class seems to reciprocate in reverse the less than 200 range, with 21 per cent of population in less than 5 per cent of villages. It is also striking how the sex ratio seems to increase with the size class of villages. There were as many as 776 villages over 10,000 each in 1961 with a population of about 12·29 millions as compared to 219 only in 1951 with a population of 3·19 millions. Some of the increase in this range has been due to declassification in 1961 of places with agricultural characteristics but reckoned as towns in 1951.

Until the details of industrial and occupational tabulations of 1961 are available, discussion on the characteristics of this growing population at work is liable to be broad. The abstract at Table V below compares the indices over 1901-61 of (a) growth of total population, (b) population of working age 15-69 and (c) population recorded as at work in each census, the year 1901 having been taken as base with a value of 100 for persons, males and females.

TABLE V  
*Indices of general growth, working age and population at work,  
1911-61*  
(Base 1901 = 100)

Year	Sex	Total population	Population of working age 15-59	Total workers
1911	P	105·62	107·75	108·94
	M	106·06	108·61	107·44
	F	105·17	106·89	111·94
1921	P	105·14	106·22	105·82
	M	106·06	107·69	105·04
	F	104·20	104·73	107·37
1931	P	116·57	118·84	108·30
	M	117·59	120·90	112·13
	F	115·52	116·75	100·69
1951	P	150·70	144·37	126·50
	M	152·71	147·74	135·16
	F	148·62	140·91	109·34
1961	P	183·40	169·0	169·14
	M	186·36	173·3	174·22
	F	180·37	164·7	159·08

It will be seen that while population has gained nearly 83 points in sixty years, the population of working age has gained only 69 and population at work 69 points during the same period. In other words, the proportion of population of working age and

the proportion of population at work, have been trailing behind general population growth. It also appears that 1961 marks a sharp departure from the historic trend. It is possible that the upswing in the 1961 participation rates, especially among females, may be due partly to the definition of work adopted for 1961 which brings the 1961 figures remarkably close to those of 1901-21, the definitions for which years were similar to that of 1961, while for 1931 and 1951 concepts of self-sufficiency in terms of earnings were introduced. It may be also due partly to a real increase which holds the mirror up to the investments of the two Plans. The great economic crisis of 1929-31 would seem to have depressed the 1931 figures, while the great influenza epidemic of 1918 would certainly have removed by death an appreciable proportion of the working population. The year 1901 would seem to have suffered, too, from the aftermaths of regional famines and a general plague epidemic, so that 1911 and 1961 seem to be the two years in the series when "normal" economic conditions were not unduly disturbed. It is well to remember these relevant landmarks, especially when one is looking for graduated trends, for even those economies that are believed to have made uninterrupted progress have betrayed unsuspected irregular peaks and troughs with level stretches. What is striking, however, is the slow change that the figures reflect and the fact of a real increase in 1961 among both sexes. A picture of this change may be obtained from the statement of indices contained in Appendix VIII (pp. 358-59).

It has been observed before that the broad sectorwise outlays in the First and Second Plans would hardly warrant more marked departures. The actuals and proportions of outlays in the First and Second Plans are given in Appendix IX (p. 360). If figures are compared with the indices of increase from 1951 in each industrial category of workers and among non-workers, with 1951 taken as base or 100 (*vide* Appendix VIII p. 358) it will be noticed that the proportion of rise in values of participation during the decade seems to correspond generally to the proportion of investment in the different sectors.

The abstract at Table VI (p. 340) looks at the historic series further by grouping the industrial categories among the primary, secondary and tertiary sectors of industry. Except for 1961, mining and quarrying have been placed in the secondary sector while, for a number of plausible reasons, construction, too, has been regarded as secondary. The primary sector is, therefore, composed of industrial categories I, II and III (excluding mining and quarrying), the secondary sector of categories IV, V, VI and mining and quarrying and the tertiary sector of VII, VIII and IX. It should be

remembered that neither of the two sectors, primary or secondary is mutually exclusive because much of III goes into II. The total share of workers has been taken as 100.

TABLE VI

*Percentage distribution of workers by sex, 1901-61*

Census year	Sex	Total workers	Primary sector (I+II+III)	Secondary sector (IV+V+VI)	Tertiary sector (VII+VIII+IX)
1901	P	100	71·76	12·61	15·63
	M	100	70·37	12·31	17·32
	F	100	74·46	13·25	12·29
1911	P	100	74·86	11·13	14·01
	M	100	73·66	10·97	15·37
	F	100	77·14	11·45	11·41
1921	P	100	75·99	10·41	13·60
	M	100	74·54	10·51	14·95
	F	100	78·80	10·21	10·99
1931	P	100	74·75	10·21	15·04
	M	100	74·08	10·43	15·49
	F	100	76·23	9·74	14·03
1951	P	100	72·12	10·62	17·26
	M	100	69·08	11·59	19·33
	F	100	79·57	8·26	12·17
1961	P	100	72·28	11·70	16·02
	M	100	67·98	12·68	19·34
	F	100	81·58	9·59	8·83

On the assumption that participation of males is a steadier and more reliable index, the statement at Table VII (p. 341) shows the distribution of male population among workers and non-workers, workers being further classified by industrial categories.

TABLE VII  
*Distribution of male population among workers, workers being further classified by industrial categories, 1901-61*

Year	Total	I	II	III	IV	V	VI	VII	VIII	IX	Total of workers (I to IX)	Non-workers X
<b>Male population</b>												
1901	100·00	32·52	7·57	2·97	..	6·95	0·51	3·75	0·97	5·87	61·11	38·89
1911	100·00	32·94	9·46	3·35	..	5·95	0·68	3·43	1·01	5·08	61·90	38·10
1921	100·00	34·11	8·18	2·99	..	5·65	0·55	3·55	0·80	4·69	60·52	39·48
1931	100·00	29·59	10·46	3·28	..	5·24	0·68	3·39	0·83	4·80	58·27	41·73
1951	100·00	28·05	8·08	1·51	..	5·32	0·64	3·36	1·10	5·99	54·05	45·95
1961	100·00	29·41	7·67	1·77	3·26	3·17	0·80	3·02	1·30	6·72	57·12	42·88

It appears to make a coherent and consistent series in spite of obvious difficulties. Category IV for household industry was an innovation in 1961. In previous years manufacture within the household and outside formed only one category—Manufacture, which explains a single figure under V for each decade preceding 1961 in Appendices X and XII as well as in Table VII. Categories I and II together have registered a small but noticeable decline, while IV and V together exhibit an upward trend from 1951, having steadily declined from 1901 till 1931. This may have been due to several reasons; the one that most readily comes to mind is that part of what used to be included in this category may have been claimed by category IX; the other is that rationalization and organization of scale have also slowly displaced the lone fabricator. The caste system may have also contributed to refined enumeration of economic functions in the earlier years which tended to be blurred subsequently. Mining and quarrying have steadily gained ground with construction activities and transport, storage and communication. Trade and commerce have fluctuated within narrow limits perhaps for the same reasons as manufacturing, while services have registered a sharp and substantial rise between 1951 and 1961.

It is in the ratio of workers among the male and female populations that sharp regional patterns are noticeable. These Regional patterns cut across political and administrative patterns of the delineations and seem to follow the outlines of culturally homogeneous areas, even overriding similarity working force of geology, soil, terrain, crop, rainfall and irrigation. If male participation in work were arranged in several ranges, most of India would seem to fall in either of two in 1961: (a) Districts where male participation in work is more than 600 per 1,000 males, and (b) Districts where it is between 500 and 599. The great central tract of India, bounded roughly by Bānda (Uttar Pradesh) in the north, Tiruchchirāppalli (Madras) in the south, Sambalpur (Orissa) in the east and the Yeotmāl-Coimbatore line in the west, shows a participation rate of more than 600. The tract of 500-599 occupies practically the rest of India, with the exception of small strips in the western coast and Kerala where the ratio drops below 500. It is, however, in the matter of female participation that smaller but distinct zones emerge. Only six of the northernmost Districts of Uttar Pradesh along with Lāhul and Spiti of Punjab indicate participation of above 600 females per 1,000 of female population. Similarly, there is only one small compact tract where participation ranges between 500 and 599; this is the east-central forest country comprising Surguja, Rānchi, Raigarh, down to Bastar in the south

and Chānda in the west upwards to Mandla and Surguja again in the north. The areas of participation 400-499 are more numerous, while the participation range of 300-399 seems to have the maximum distribution throughout India. Only the east-central areas of Uttar Pradesh, the southern zone of Punjab, the north-western Districts of Rājasthān, and the coastal areas of Mysore have contiguous stretches of participation ranging between 250 and 299. Most of the remaining country except for isolated Districts have a participation rate below 250. Such a distribution may be due to and responsible for the complex cultural fabric of India.

The differences in the rural and urban patterns of the working force as presented in the Table at Appendix XII (p. 362) may help in the understanding of what is happening in the town and country areas as a result of the Five Year Plans. It is well to bear in mind that the ratios given in this table as well as those in other tables are not strictly comparable, being subject to a certain amount of definitional and conceptional chiselling for successive census years. Nevertheless, it appears that so far as the total of all workers is concerned, there has been an appreciable increase in their population, both male and female, in the rural areas, the increase recording much higher proportions in 1961 in every case than the decennial population growth. Further, the substantial increase in total workers of all categories together (I—IX) in rural areas is both absolute and comparative. It should be borne in mind that in rural areas the working force tends to be the same as the labour force, that is, most persons able to work are returned as working. The urban areas have not fared even half as well by comparison. Although the proportions of population growth in the urban areas are higher than in the rural areas in both male and female, yet the ratios of urban workers in 1961 in each case are behind those of population growth in the rural areas. Thus, the argument that India, despite its very small urban ratio is over urbanized, a distressing paradox, is perhaps to some extent valid, and this again may be at the root of the none-too-rapid rate of urban growth.

Cultivators (I) in rural areas show substantial increase, both absolute and comparative. But it is significant that the increases in category I are markedly less than in household and non-household industry and manufacture and even in VI and IX (except for females) in rural areas. Notwithstanding the fact that the absolute base of category I is very large compared to those of other categories and, therefore, overshadows in absolute terms much steeper and more spectacular increases in others, the increase unmistakably points to a change in relationships in rural areas. The decrease in

the urban proportion for males in category I and the more marked falls in the comparative ratios may be due partly to land reforms, the shrinking of agricultural land in the neighbourhood of towns by the latter's extension, and partly to the elimination of a large number of agricultural towns classified as such in 1951.

Agricultural labourers (II) show a generally low index of growth in rural areas, category VII alone registering a still lower rate. The ratios, substantial and all in the negative, indicate genuine decline in proportions. This trend is reflected in the urban areas also in a far more decisive manner.

Forestry, fishing, hunting, etc., (III) record a substantial increase in rural areas, but an almost equally substantial decrease among females in urban areas, considering the low female base. The decrease in the female ratios does not admit of a ready explanation, but it is possible that the manufacturing or processing part of the operations connected with activities such as forestry, hunting, fishing, horticulture, plantations and even small scale quarrying, which would formerly have been appropriated by category III, has been separated and claimed in 1961 by category IV which shows high increase.

Household industry and manufacturing have shown striking increase in both rural and urban areas, surpassed only by construction and transport, storage and communication (VI & VIII) in urban areas which undoubtedly have much lower absolute bases. Increases in these categories have doubtless been assisted by the definition of "family worker", especially when one considers the phenomenal rise among female workers in rural areas ; but male increases have been markedly high, too, in both rural and urban areas. Of particular interest is the high increase among female workers in household industry and manufacturing, in urban areas.

The statement reflects in a truer measure the character of the increase among males in both rural and urban areas in construction, and a countervailing stagnation among females again in both rural and urban areas. The increase in male construction workers in rural areas has been even more pronounced than in towns, testifying to the common experience of an unprecedented spate of building and construction activity all over the land.

Trade and commerce (VII) present an intriguing state of affairs. Common experience, borne out by figures of investment turnover, shipment, carriage and sale of goods, seems to assure us that there is now more of buying and selling than ever before, whereas, although the rural and urban indices testify to some absolute numerical increase among males, the rural and urban indices show appreciable declines.

Transport, storage and communication (VIII), as observed before, show high increase among males in both rural and urban areas, but a disturbing decrease in the female indices and ratios in urban areas, and even more so in rural areas.

Services (IX) again bear out the generally observed prosperity and better distribution of national services and institutions in the rural areas, while urban ratios bear testimony to the way services are lagging behind the rate of population increase in city and town.

Non-workers (X) show how there has been an appreciable, comparative rise in employment in the rural sector, which has surpassed even the rate of decennial population growth, and how a contrary process has been in operation in urban areas, where the proportion of male non-workers has been on the increase both in absolute and comparative terms. The high proportions of non-working males, are an index of our sluggish decennial urban growth.

The progress of general literacy presents a paradox. While the absolute increase over 1951 may, on any showing, be regarded as gratifying, the proportionate increase during the Progress of literacy decade has been sluggish throughout the country, having increased at an average of 0·8 per cent per year for the general population, 1·0 per cent for males and 0·5 for females. Not excluding Madhya Pradesh and Rājasthān among the States which show an appreciable rise, none has even doubled its 1951 rates except perhaps Himāchal Pradesh and Manipur where this achievement was possible because of the low population base and the inordinately low rates prevailing in 1951. The statement at Appendix XIII (p. 363) ranks the States in literacy rates for 1961 and 1951.

The more distressing has been low progress of female literacy. Although for the whole of India the female literacy rate is slightly more than half of the general rate, yet there are large regions in the map where it is less than a quarter of the general literacy rate, i.e., less than 60 per 1,000 females. When we remember that even this low rate would have been still lower but for a higher rate in towns and cities situated in these areas, the state of literacy can be properly comprehended. A high order of waste still occurs in the first few years of the primary stage of education, since boys and girls are drawn away to help in cultivation and shepherding in the middle of term. Vacations in many places are not synchronized with the heavy agricultural seasons of sowing and harvesting. School hours fail to accommodate the rush hours in a cultivating household. The persistently large number of single-teacher schools makes school going dull and often unprofitable, while the tardiness in enforcing compulsory primary

education and a minimum school leaving age in most areas fails to inject urgency into the community and militates against family limitation, children being regarded as a reserve pool of cheap manpower.

How concentrated literacy is in urban areas, which still further reduces the rural rates, will appear from Table VIII. The figures will also make it clear how even urban literacy tends to concentrate in bigger and still bigger cities.

TABLE VIII

*All-India literacy rates for cities, towns and rural areas in 1961  
(excluding NEFA, Goa, Damān and Diu)*

Description	Rate per cent		
	P	M	F
<b>Literacy rates in:—</b>			
1. Cities over 1 million	56·40	63·85	46·36
2. Cities of 0·5 to 1 million	49·60	58·38	38·43
3. Cities of 0·1 to 0·5 „	48·52	58·51	36·78
4. Cities above 100,000	51·81	60·74	40·65
5. Non-city urban population	42·99*	54·69*	29·73*
6. Urban India	46·94*	57·46*	34·48*
7. Rural India	19·00	29·07	8·54
8. All-India	24·02	34·44	12·95

\*Excludes Union Territories except Delhi.

Brief mention should be made of the distribution of the major religious communities in India. Appendix XIV (p. 364) shows the populations of Buddhists, Christians, Hindus, Jains, Muslims and Sikhs in 1961, and Appendix XV (p. 365) gives their proportion to the total population in 1951 and 1961. It is significant that while the proportion of Buddhists in 1951 was about 1 per 1,000, in 1961 it grew to as much as 7, not wholly by a process of biological increase but also through the vigour of the Neo-Buddhist movement during the decade.

The decline in the proportion of Hindus is obviously explained by a corresponding increase in the proportion of Buddhists along with small but perceptible increases in the proportion of Christians, Muslims and Sikhs. Christians seem to have improved their proportion at the expense of populations professing tribal

and indefinite beliefs. The increase in the proportion of Muslims suggests accretions and fresh influx of members of this community from Pākistān in Assam, Tripura, Bihār, Rājasthān, Uttar Pradesh and West Bengal. The strength of Zoroastrian community was 100,687 in 1961.

An important sociological as well as constitutional classification is that of the Scheduled Castes and Scheduled Tribes. The President by a special order scheduled particular castes among Hindus and Sikhs in particular areas for special treatment; that also applies to tribes, irrespective of their religious persuasion. With notable exceptions, members of the Scheduled Castes and Tribes are regarded as culturally and economically less advanced than the general run of population. The 1961 count gives the figure of the Scheduled Castes throughout the country as 64·4 millions in round figures or 14·7 per cent of the total population. Scheduled Tribes account for 30·1 millions or 6·9 per cent of the population. Together they comprise 21·5 per cent of India's population. The States of Assam, Bihār, Madhya Pradesh, Orissa, Rājasthān and West Bengal and the Union Territories of the Andaman and Nicobar Islands, Himāchal Pradesh, Laccadive, Minicoy and Amīndīvi Islands, Manipur, Tripura, Dādra and Nagar Haveli, and NEFA account for much of the high proportions of members of Scheduled Castes and Scheduled Tribes, than the all-India average. Only a little more than ten per cent (10·7) of all members of Scheduled Castes in India live in urban areas, making up for 8·7 per cent of India's total urban population, while as few as 2·6 per cent of all members of Scheduled Tribes live in cities and towns accounting for less than 1 per cent (0·98) of India's total urban population, thus lending an edge to the country's programme of social and economic development.

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## APPENDIX I

*Ranking of States and Union Territories in terms of population and area, 1961 and 1951*

Rank in popu- lation 1961	Name of State or Union Territory	Percentage of Union's population	Percentage of Union's area	Rank in area	Rank in population in 1951
(1)	(2)	(3)	(4)	(5)	(6)
<i>States</i>					
1.	Uttar Pradesh . . .	16·79	9·27	4	1
2.	Bihār . . .	10·58	5·45	8	2
3.	Mahārāshtra . . .	9·00	9·63	3	3
4.	Andhra Pradesh . . .	8·19	8·63	5	4
5.	West Bengal . . .	7·95	2·78	14	6
6.	Madras . . .	7·67	4·08	11	5
7.	Madhya Pradesh . . .	7·37	13·76	1	7
8.	Mysore . . .	5·37	6·01	6	8
9.	Gujarāt . . .	4·70	5·78	7	9
10.	Punjab . . .	4·62	3·85	12	10
11.	Rājasthān . . .	4·59	10·74	2	11
12.	Orissa . . .	4·00	4·90	9	12
13.	Kerala . . .	3·85	1·22	16	13
14.	Assam . . .	2·70	3·85	13	14
15.	Jammu and Kashmir	0·81	4·37*	10*	15
<i>Union Territories and Other Areas</i>					
16.	Delhi . . .	0·61	0·05	24	16
17.	Himāchal Pradesh . .	0·31	0·87	17	17
18.	Tripura . . .	0·26	0·34	20	18
19.	Manipur . . .	0·18	0·70	18	20
20.	Goa, Damān and Diu	0·14	0·12	23	19
21.	Nāgāland . . .	0·08	0·52	19	22

1	2	3	4	5	6
22.	Pondicherry . .	0·08	0·01	26	21
23.	NEFA . . .	0·08	2·56*	15*	..
24.	Andaman and Nicobar Islands	0·01	0·26*	21*	25
25.	Dādra and Nagar Haveli	0·01	0·02	25	24
26.	Laccadive, Minicoy and Amīndivi Islands	0·01	0·001	27	26
27.	SIKKIM . .	0·04	0·23	22	23

\*Based on the Surveyor General India's figures.

## APPENDIX II

*Proportion of population related to proportion of area in different density ranges in India, 1961*

Density Ranges : Persons per sq. mile (2·59 sq. km.)

1	2	3	4	5	6	7
<b>INDIA</b>						
(a) Percentage of Population to total population	8·59	23·49	13·20	22·98	14·73	17·01
(b) Proportion to total area	30·67	32·90	11·89	13·73	6·42	4·39
Andhra Pradesh . . (a)	5·75	44·26	10·87	39·12	..	..
	(b)	11·65	57·24	9·21	21·90	..
Assam . . . . (a)	11·08	13·17	36·57	39·18	..	..
	(b)	48·10	10·61	22·90	18·39	..
Bihār . . . . (a)	..	12·32	10·17	13·58	29·01	34·92
	(b)	..	28·29	15·90	12·87	24·57
Gujarāt . . . . (a)	6·94	38·17	15·31	39·58	..	..
	(b)	29·81	40·55	9·93	19·71	..
Jammu and Kashmir . . (a)	26·32	41·18	14·52	17·98	..	..
	(b)	84·89	10·54	2·33	2·24	..

	1	2	3	4	5	6	7
Kerala . . .	(a) ..	..	..	10·25	21·04	68·71	
	(b) ..	..	..	16·37	27·80	55·83	
Madhya Pradesh . . .	(a) 39·01	56·68	1·98	2·33	..	..	
	(b) 53·75	44·42	1·02	0·81	..	..	
Madras . . .	(a) ..	..	1·21	81·06	9·64	8·09	
	(b) ..	..	1·96	89·20	7·46	1·38	
Mahārāshtra . . .	(a) 3·13	49·61	32·72	4·04	..	10·50	
	(b) 8·53	60·87	27·77	2·69	..	0·14	
Mysore . . .	(a) 2·92	46·78	39·68	..	10·62	..	
	(b) 5·38	59·00	31·39	..	4·23	..	
Orissa . . .	(a) 21·54	31·65	21·30	25·51	..	..	
	(b) 38·30	35·97	14·57	11·16	..	..	
Punjab . . .	(a) 5·33	7·59	30·22	33·36	23·50	..	
	(b) 21·13	11·34	29·57	25·36	12·60	..	
Rājasthān . . .	(a) 43·91	40·95	15·14	..	..	..	
	(b) 68·88	24·66	6·46	..	..	..	
Uttar Pradesh . . .	(a) 2·85	6·32	4·02	23·78	38·42	24·61	
	(b) 13·57	14·50	6·48	22·77	28·45	14·23	
West Bengal . . .	(a) ..	..	1·79	16·34	22·99	58·88	
	(b) ..	..	3·68	27·78	28·37	40·17	
Himāchal Pradesh . . .	(a) 59·81	28·44	11·75	..	..	..	
	(b) 80·67	15·14	4·19	..	..	..	
Goa, Damān and Diu . . .	(a) ..	..	94·15	..	2·28	3·57	
	(b) ..	..	97·41	..	1·05	1·54	
Pondicherry . . .	(a) ..	..	..	..	..	100·0	
	(b) ..	..	..	..	..	100·0	
Nāgāland . . .	(a) 100·0	..	..	..	..	..	
	(b) 100·0	..	..	..	..	..	

## APPENDIX III

*Number of districts in different density ranges which recorded increases of 21 per cent and over during 1951-61*

States	Less than 80			80-119			120-199			200 and Over		
	21-25	26-30	Over 30	21-25	26-30	Over 30	21-25	26-30	Over 30	a	b	c
1. Andhra Pradesh	.	.	1	1	..	..	1	..	..	..	..	..
2. Assam	.	.	..	2	2	..	1	..	3	1	..	..
3. Bihar	.	.	..	..	..	..	2	..	..	1	2	..
4. Gujarat	.	.	1	..	2	2	1	1	3	1	2	1
5. Kerala	.	.	..	..	..	..	..	..	..	1	2	3
6. Madhya Pradesh	.	.	10	7	2	11	3	2	4	..	1	..
7. Madras	.	.	..	..	..	..	..	..	..	1	2	..
8. Maharashtra	.	.	..	..	..	5	3	..	4	3	..	..
9. Mysore	.	.	..	..	1	..	1	3	4	..	..	..
10. Orissa	.	.	..	..	..	1	1	..	..	1	1	..
11. Punjab	.	.	..	..	1	..	1	1	2	2	..	3
12. Rajasthan	.	.	5	5	3	4	..	2	2	..	..	2
13. Uttar Pradesh	.	.	..	..	..	2	..	1	2	..	5	..
14. West Bengal	.	.	..	..	..	..	..	..	..	1	..	4
India	.	.	17	14	12	26	10	11	22	10	8	14
Total			43				10			40		47
										Grand		46
											TOTAL	176

APPENDIX IV

*Expectation of male and female lives at 0, 10, 20, 30, 40, 50, and 60  
for All-India, 1881-1961*

## APPENDIX V

Percentage distribution of India's population, 1901-61

**Note:**— 1961 figures are based on unsmoothed population count and exclude the population of NEFA and Goa, Damān and Diu. Percentages of 1901-31 are based on unadjusted and those of 1941 and 1951 on adjusted data. The proportions for 1961 on data smoothed by the Census Actuaries are.

1

	M.	F.
0-14	40.6	41.7
15-44	44.3	43.6
45-59	10.4	9.7
60+	4.7	5.0

Panjābī	Sanskrit	Tamil	Telugu	Urdū
13	14	15	16	17
9,530,863	2,460	30,169,724	37,614,768	23,148,937
10,125	25	434,713	30,932,257	2,553,753
8,938	..	4,501	19,786	11,263
70,988	129	16,177	37,214	4,149,245
14,627	99	13,264	10,542	594,538
109,174	3	349	172	12,445
1,147	7	527,613	44,838	9,160
103,291	384	26,173	55,824	740,098
3,473	117	28,011,099	3,363,579	615,503
101,317	82	159,396	623,803	2,725,689
5,336	125	854,227	2,044,249	2,034,481
6,966	..	6,918	393,453	212,891
8,336,787	124	6,789	2,410	255,660
401,115	31	3,443	1,181	509,654
345,181	1,330	12,399	4,530	7,891,710
12,398	4	32,663	80,930	832,847



## APPENDIX VII

*Proportions of persons speaking major languages in each of the States, 1961*

State	Total speakers	Total columns 4-17				Major languages										
		Assamese	Bengali	Gujarāti	Hindi	Kannada	Kashmiri	Layālam	Mārāthī	Oriyā	Pāṇjabī	Sanskrit	Tamil	Telugu	Urdu	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
All States	10,000	8,475	158	764	465	2,801	401	44	393	759	362	221	N	698	872	537
Andhra Pradesh	10,000	9,716	N	1	6	38	106	N	6	77	52	3	N	121	8,596	710
Assam	10,000	8,049	5,714	1,736	1	431	N	N	2	5	123	8	..	4	16	9
Bihar	10,000	5,670	N	251	4	4,427	N	N	2	1	65	15	N	4	8	893
Gujarat	10,000	9,550	N	2	9,049	93	3	N	4	93	N	7	N	6	5	288
Jammu and Kashmir	10,000	5,733	N	1	N	63	N	5,325	N	1	N	307	N	1	N	35
Kerala	10,000	9,905	N	N	4	4	37	N	9,504	11	N	1	N	312	27	5
Madhya Pradesh	10,000	7,408	N	16	40	6,699	1	N	6	266	94	32	N	8	17	229
Madras	10,000	9,902	N	1	5	12	253	N	119	.15	N	1	N	8,315	998	-183
Maharashtra	10,000	9,292	N	7	270	275	159	N	23	7,644	1	26	N	40	158	689
Mysore	10,000	9,225	N	1	12	35	6,512	N	123	448	N	2	N	362	867	863
Orissa	10,000	8,759	..	72	5	99	N	N	3	1	8,226	4	..	4	224	121
Punjab	10,000	9,813	1	2	1	5,564	N	4	3	N	4,105	N	3	1	126	126
Rajasthan	10,000	809	N	4	21	323	N	N	1	4	1	199	N	2	1	253
Uttar Pradesh	10,000	9,606	N	14	2	8,467	N	N	1	2	N	47	N	2	1	1,070
West Bengal	10,000	9,314	2	8,420	7	542	N	N	3	4	61	4	N	9	23	239

Note:—Data is incomplete and subject to correction.

N=Negligible.

## APPENDIX VIII

*Indices of workers in each industrial category and non-workers  
1901-61*

Year	Sex	Total population	Population in labour force age group 15-59	Total workers	Cultivators	Agricultural labourers	Workers in plantations, forests, & quarrying etc.	Workers at household industry	Workers in manufacturing, mining & quarrying other than household industry	Workers in commerce	Workers in trade & commerce	Workers in transport, storage & communication	Non-workers in other services	Base 1901=100						
														I	II	III	IV	V		
P	105.62	107.75	108.94	107.10	132.71	119.70 (252.05)		92.13	134.81	99.09	108.51	95.03	102.72							
1911	M	106.06	108.61	107.44	107.44	132.54	119.50 (278.68)		90.89	141.26	97.23	108.86	91.86	103.90						
F	105.17	106.89	111.94	106.32	132.87	120.28 (218.09)		94.39	118.69	102.92	103.18	104.79	102.04							
P	105.14	106.22	105.82	113.65	109.04	109.69 (279.88)		83.77	114.55	100.21	88.31	86.71	104.55							

1921	M	106·06	107·69	105·04	111·24	114·58	106·71 (293·66)	86·24	113·57	100·58	88·37	84·65	107·66
	F	104·20	104·73	107·37	119·23	103·78	118·56 (258·29)	79·30	116·98	99·44	87·48	93·06	102·73
1931	P	116·57	118·84	108·30	96·33	158·97	129·97 (272·73)	82·22	144·43	100·06	98·99	107·79	123·78
	M	117·59	120·90	112·13	106·99	162·54	129·80 (320·34)	88·67	155·19	106·41	101·27	96·24	126·16
1951	F	115·52	116·75	100·69	71·63	155·58	130·47 (198·23)	70·55	117·54	86·96	64·00	143·35	122·40
	P	150·70	144·37†	126·50	125·58	146·34	86·20 (684·97)	96·96	170·23	108·89	171·66	156·57	171·82
1961	M	152·71	147·74†	135·16	132·34	161·71	77·24 (783·00)	116·61	191·28	136·28	172·37	156·09	180·29
	F	148·62	140·91†	109·34	109·92	131·83	112·94 (531·60)	61·40	117·65	52·38	160·77	158·04	166·86
1961	P	183·40	169·14*	169·14	176·38	167·36	107·92	152·92	237·64	113·33	239·94	207·40	195·86
	M.	186·36	173·3*	174·22	168·50	188·74	111·13	172·64	292·75	150·32	250·09	213·45	205·43
	F	180·37	164·7*	159·08	194·66	147·15	98·34	117·24	97·88	37·04	84·45	188·78	190·25

Note:—Figures in brackets denote mining and quarrying.

\*For 1951 the age group was 15—64.

†Estimated population in age group 15-59 is P (238·5), M (123·7) and F (114·8) millions in a population of 439 millions in 1961. (See *Third Five Year Plan* p. 751).

## APPENDIX IX

*Outlay in First and Second Five Year Plans\**

(Rs. Lakhs)

	First Plan	Second Plan	Total	Percen- tage
<b>1. I, II &amp; III (excluding mining &amp; quarrying)</b>				
(a) Agricultural programmes, I, II & III ( <i>minus</i> mining & quarrying)	20,586	27,146	..	..
(b) Multipurpose projects & irrigation and flood control	23,661†	42,017	..	..
	<u>19,744‡}</u>	<u>63,991</u>	<u>69,163</u>	<u>133,154</u>
				20·3
<b>2. III, IV and V Mining and manufacturing</b>				
(a) Industry and mining . . .	9,683	107,555	..	..
(b) Power . . . .	14,883	44,549	..	..
	<u>24,566</u>	<u>152,104</u>	<u>176,670</u>	<u>26·9</u>
<b>3. VI Construction</b>				
(a) Community development including Panchayats & local development works	7,903	21,873	..	..
(b) Housing . . . .	3,348	8,033	..	..
	<u>11,251</u>	<u>29,906</u>	<u>41,157</u>	<u>6·3</u>
<b>4. VIII Transport, storage and communication</b>				
(a) Transport and communication	51,781	129,975	..	..
(b) Co-operation including warehousing, marketing and storage	500	3,881	..	..
	<u>52,281</u>	<u>133,856</u>	<u>186,137</u>	<u>28·4</u>
<b>5. IX Other Services</b>				
(a) Social services . . .	37,843	64,991	..	..
(b) Miscellaneous . . .	6,068	9,980	..	..
	<u>43,911</u>	<u>74,971</u>	<u>118,882</u>	<u>18·1</u>
	<u>196,000</u>	<u>460,000</u>	<u>656,000</u>	<u>100</u>

\*Third Five Year Plan, pp. 738-9.

†Outlay on Multipurpose Projects (First Plan).

‡Outlay on Irrigation and Flood Control (First Plan).

## APPENDIX X

*Indices of increase in industrial participation  
1951-61*

		Base 1951=100		
		P	M	F
Total Population . . . . .		121·69	122·02	121·34
<b>Categories of workers :</b>				
I Cultivators . . . . .		140·86	127·52	178·20
II Agricultural labourers . . . . .		114·21	116·56	111·47
III Workers in plantations, forests, mining & quarrying etc.		125·05	143·76	86·91
IV Workers at household industry . . .		157·97	148·13	192·18
V Workers in manufacturing other than household industry		139·04	152·89	83·10
VI Workers in construction . . . . .		103·87	110·13	70·40
VII Workers in trade and commerce . . . . .		139·75	145·09	52·17
VIII Workers in transport, storage & communication		132·35	136·69	119·26
Total workers . . . . .		133·81	128·96	145·70
Non-workers . . . . .		113·90	113·87	113·93

## APPENDIX XI

*Proportion of total outlay in First and Second Plans*

I, II & III (excluding mining & quarrying)	III (mining & quarrying), IV & V	Construction VI	VIII	IX
20·3	26·9	6·3	28·4	18·1

## APPENDIX XII

*Percentage distribution of population into workers and non-workers, workers further classified into nine categories—  
1951-61—Rural and Urban*

*Rural*

Sex	Total Population (I-X)		Total Workers (I-IX)		I		II		III		IV+V*	
	1951	1961	1951	1961	1951	1961	1951	1961	1951	1961	1951	1961
P	100	100	40.28	44.95	23.11	27.17	9.04	8.50	1.01	1.64	2.55	2.80
M	100	100	54.27	58.04	33.39	35.55	9.52	9.18	1.37	2.37	3.41	3.53
F	100	100	25.79	31.37	12.47	18.48	8.54	7.79	0.65	0.90	1.66	2.04
	VI		VII		VIII		IX		X(Non-workers)			
	1951	1961	1951	1961	1951	1961	1951	1961	1951	1961	1951	1961
	0.25	0.30	1.15	0.93	0.25	0.25	2.76	3.17	59.72	55.05		
	0.41	0.52	1.72	1.53	0.44	0.47	3.76	4.60	45.73	41.96		
	0.09	0.08	0.56	0.31	0.05	0.01	1.71	1.69	74.21	68.63		

*Urban*

Sex	(I-X)		(I-IX)		I		II		III		IV+V*	
	1951	1961	1951	1961	1951	1961	1951	1961	1951	1961	1951	1961
P	100	100	33.54	33.14	2.68	2.19	1.40	1.16	0.54	0.59	8.46	9.50
M	100	100	53.16	52.03	4.06	2.91	1.64	1.16	0.89	1.04	13.72	14.87
F	100	100	10.74	10.76	1.08	1.34	1.11	1.17	0.14	0.05	2.34	3.15
	VI		VII		VIII		IX		X(Non-workers)			
	1951	1961	1951	1961	1951	1961	1951	1961	1951	1961	1951	1961
	0.96	1.22	6.31	5.46	2.26	2.69	10.74	10.06	66.46	66.86		
	1.55	2.02	10.72	9.43	4.06	4.85	16.21	15.34	46.84	47.97		
	0.28	0.28	1.19	0.75	0.17	0.13	4.37	3.80	89.26	89.24		

\*IV & V stand for the entire field of manufacture, IV for manufacture in household industry and V in non-household industry. IV and V were separately censused in 1961 but not in 1951. To achieve comparability of 1961 with 1951 the two have been clubbed together.

## APPENDIX XIII

*General literacy rates in 1961 & 1951*

Rank 1961	State, Territory, Area	Rate per 1,000		Rank 1951
		1961	1951	
1. Delhi . . . . . . .		527	384	2
2. Kerala . . . . . . .		468	407	1
3. Pondicherry . . . . . . .		374	N.A.	N.A.
4. Andaman and Nicobar Islands . . . . . . .		336	258	3
5. Madras . . . . . . .		314	208	8
6. Goa, Damān and Diu . . . . . . .		308	229	6
7. Gujarāt . . . . . . .		305	231	5
8. Manipur . . . . . . .		304	114	17
9. Mahārāshtra . . . . . . .		298	209	7
10. West Bengal . . . . . . .		293	240	4
11. Assam . . . . . . .		274	183	10
12. Mysore . . . . . . .		254	193	9
13. Punjab . . . . . . .		242	152	13
14. Laccadive, Minicoy and Amīndivi Islands .		233	152	14
15. Orissa . . . . . . .		217	158	11
16. Andhra Pradesh . . . . . . .		212	131	15
17. Tripura . . . . . . .		202	155	12
18. Bihār . . . . . . .		184	122	16
19. Nāgāland . . . . . . .		179	104	19
20. Uttar Pradesh . . . . . . .		176	108	18
21. Himāchal Pradesh . . . . . . .		171	77	22
22. Madhya Pradesh . . . . . . .		171	98	20
23. Rājasthān . . . . . . .		152	89	21
24. SIKKIM . . . . . . .		123	73	23
25. Jammu and Kashmīr . . . . . . .		110	N.A.	N.A.
26. Dādra and Nagar Haveli . . . . . . .		95	40	24
27. NEFA . . . . . . .		71	N.A.	N.A.
INDIA . . . . . . .		240	166	..

## APPENDIX XIV

*Population of major religions, 1961*

	Buddhists	Christians	Hindus	Jains	Muslims	Sikhs
1	2	3	4	5	6	7
<b>INDIA .</b>	<b>3,256,036</b>	<b>10,728,086</b>	<b>366,526,866</b>	<b>2,027,281</b>	<b>46,940,799</b>	<b>7,845,915</b>
<i>States</i>						
Andhra Pradesh .	6,753	1,428,729	31,813,944	9,012	2,715,021	8,563
Assam . .	36,513	764,553	7,884,921	9,468	2,765,509	9,686
Bihār . .	2,885	502,195	39,345,517	17,598	5,785,631	44,413
Gujarāt . .	3,185	91,028	18,356,065	409,754	1,745,103	9,646
Jammu and Kashmīr. .	48,360	2,848	1,013,193	1,427	2,432,067	63,069
Kerala . .	228	3,587,365	10,282,568	2,967	3,027,639	822
Madhya Pradesh	113,365	188,314	30,425,798	247,927	1,317,617	65,715
Madras . .	777	1,762,954	30,297,115	28,350	1,560,414	2,567
Mahārāshtra .	2,789,501	560,594	32,530,901	485,672	3,034,332	57,617
Mysore . .	9,770	487,587	20,582,853	174,366	2,328,376	3,287
Orissa . .	454	201,017	17,123,194	2,295	215,319	5,030
Punjab . .	14,857	149,834	12,930,045	48,754	393,314	6,769,129
Rājasthān . .	759	22,864	18,132,690	409,417	1,314,613	274,198
Uttar Pradesh .	12,893	101,641	62,437,316	122,108	10,788,089	283,737
West Bengal . .	112,253	204,530	27,523,358	26,940	6,985,287	34,184
<i>Union Territories and Other Areas</i>						
Andaman and Nicobar Is- lands . .	1,707	17,973	32,781	3	7,398	241
Delhi . .	5,466	29,269	2,234,597	29,595	155,453	203,916
Himāchal Pra- des . .	6,308	592	1,310,019	95	25,619	8,437
Laccadive, Mini- coy and Amin- divi Islands . .	..	56	263	..	23,789	..

	1	2	3	4	5	6	7
Manipur . .	325	152,043	481,112	778	48,588	523	
Tripura . .	33,716	10,039	867,998	195	230,002	49	
Dādra and Nagar Haveli	2	799	56,576	120	443	..	
Goa, Damān and Diu	189	227,202	384,378	68	14,600	..	
Pondicherry . .	25	33,946	311,223	76	23,470	14	
NEFA . .	5,809	1,713	25,599	14	1,008	745	
Nāgāland . .	42	195,588	34,677	263	891	255	
SIKKIM . .	49,894	2,813	108,165	19	1,207	72	

\*Excludes that area of NEFA where simplified census Schedule instead of All India Census Schedule was canvassed.

## APPENDIX XV

### *Proportion of major religions of India, 1961*

	Buddhists		Christians		Hindus		Jains		Muslims		Sikhs	
	1951	1961	1951	1961	1951	1961	1951	1961	1951	1961	1951	1961
1	2	3	4	5	6	7						
INDIA . .	1	7	23	25	850	840	5	5	99	102	17	18
<i>States</i>												
Andhra Pradesh	N	N	40	40	882	884	N	N	77	75	N	N
Assam . .	3	3	55	64	667	664	N	1	226	233	N	1
Bihar . .	N	N	11	11	853	847	N	N	113	125	1	1
Gujarat . .	N	N	5	4	881	890	23	20	89	85	1	N
Jammu and Kashmir . .	..	14	..	1	..	284	..	N	..	683	..	18
Kerala . .	N	N	209	212	616	608	N	N	175	179	N	N
Madhya Pradesh	N	3	3	6	948	940	7	8	40	41	2	2
Madras . .	N	N	47	52	904	899	1	1	48	46	N	N
Mahārāshtra . .	N	71	14	14	895	822	11	12	76	77	1	1
Mysore . .	N	N	22	21	870	873	7	7	101	99	N	N

	1	2	3	4	5	6	7
Orissa . . N N 10 11 978 976 N N 12 12 N N							
Punjab . . N 1 6 7 623 637 3 2 18 19 350 333							
Rājasthān . N N 1 1 905 900 23 20 62 65 9 14							
Uttar Pradesh N N 2 1 850 847 2 2 143 146 3 4							
West Bengal . 3 3 7 6 789 788 1 1 195 200 1 1							
<i>Union Territories and Other Areas</i>							
Andaman and Nicobar Is- lands 52 27 307 283 300 516 N N 154 116 4 4							
Delhi . . N 2 11 11 842 841 11 11 57 58 79 77							
Himāchal Pra- desh . . N 5 N N 981 970 N N 14 19 5 6							
Laccadive, Mi- nicoy and Amaīndivi Is- lands . . O O N 2 1 11 O O 999 987 O O							
Manipur . N N 119 195 601 617 N 1 64 62 N 1							
Tripura . . 24 30 8 9 752 760 N N 215 201 N N							
Dādra and Nagar Haveli .. N 21 14 975 976 O 2 4 8 O O							
Goa, Damān and Diu . . N N 392 363 584 613 O N 23 23 O O							
Pondicherry . .. N .. 92 .. 843 .. N .. 64 .. N							
NEFA . . .. 150 .. 44 .. 661 .. N .. 26 .. 19							
Nägāland . N N 461 530 41 94 N 1 2 2 1 1							
SIKKIM . . 286 308 2 17 711 667 N N 1 7 N N							

NOTE:—(1) To enable comparison with 1951 figures, Jammu and Kashmīr, NEFA and Pondicherry have been excluded from 1961.

- (2) The figures of Jammu and Kashmīr, NEFA and Pondicherry are not available for 1951.
- (3) The figures of NEFA relate to that portion where All-India Census Schedule was canvassed and not to the whole territory.
- (4) 'N' denotes negligible.
- (5) 'O' indicates that there are no figures at all.
- (6) '..' indicates that figures are not available.

## CHAPTER VII

### LANGUAGES

#### 1. *Linguistic Progress*

IN 1931 THE POPULATION of undivided India was 338 millions, about a fifth of the human race. Twenty years later, and four years after the Partition, the entire subcontinent comprising the two independent countries of India and Pākistān registered a population of 437 millions, an increase within a generation of about 100 millions. The large interchange of population between India and Pākistān and the fact that certain languages are spoken in both the countries make it difficult to put down precisely the population figures for the different languages of India. For example, of the Bengali-speaking population, which perhaps by now has reached the 70 million mark, over 40 millions are in East Pākistān (East Bengal) and a little less than 30 millions in West Bengal, apart from approximately 3 millions in Assam and in Bihār. As regards Sindhi, possibly a little less than a million of those who speak that language found refuge in India, while the rest, almost entirely Muslims, are in Sind. It is the same with Panjābi\*. The language figures for India are now somewhat confused because of this situation.

Other problems have also assumed importance. The question of Hindi-Urdū-Hindustāni has created confusion and misunderstanding in the scientific classification or demarcation of the languages and dialects of North India. Yet, some general lines of classification can be laid down. It is possible to bring about harmony between diverse trends of opinion and varieties of numerical data which the investigator would have to face. The broad outlines, which have gradually been established, give us a clear idea of the situation regarding Indian languages and dialects in their various families and groups.

The Indo-Aryan speakers of North India, as early as the first half of the 1st millennium B.C. started to make a scientific study of their language, particularly in the literary forms which became established with the Vedas and subsequent early Sanskrit literature. The scientific study of the Old Indo-Aryan speech by the ancient Indian grammarians of the middle of the 1st millennium

\* While the State name has been spelt Punjab, following the Survey of India, the language and people's name has been, in deference to the author's wish, spelt Panjābi.

B.C. culminated in that most remarkable linguistic achievement of ancient times anywhere in the world—the Sanskrit grammar of Pāṇini (5th century B.C.). In this grammar, named the *Aṣṭādhyāyī* ("Eight Chapters"), Pāṇini has given in the form of brief aphorisms a most detailed descriptive study of the phonetic and morphological phenomena of both the Vedic and Classical Sanskrit, that is, of the Old Indo-Aryan speech.

Although deeply interested in the study of their own speech, the Indians in general were not attracted by the phenomenon, found on the soil of India from high antiquity, of the diversity of languages. The Aryan speaker was not interested in the languages of the pre-Aryan peoples—for him it was just *pralāpa*, a kind of gibberish. He was, of course, sensitive to dialectical differences in his own speech; and subsequently, with the passage of time, as the Aryan language spread over the greater part of North India and penetrated into the Deccan, those who spoke that language in its various later modifications felt a sort of keenness about dialectical variations. These variations the later grammarians tried to indicate in proper grammatical treatises. We do not know the reaction of the first non-Aryans who were face to face with the Aryan language. Possibly, great prestige was attached to this speech of a virile, well-organized and well-disciplined race—the Aryans. The non-Aryans found it convenient to adopt the Aryan language as a common speech; that alone could bring together in North India peoples of diverse languages—Dravidian, Sino-Tibetan and Austro-Asiatic.

A growing mass of people, the result of racial miscegenation, was adopting the Aryan language as its own. In these and other ways the Aryan language began to spread all over the country as a matter of course. References to languages other than Aryan dialects are exceedingly rare in Sanskrit and other Aryan literature. At the turn of the Christian era, literary endeavour in the South Indian languages appears to have just begun. The Aryan language made a place for itself very early in the Andhra and Karnātaka countries, where Sanskrit and the Prākrits appear to have been accepted without any opposition or questioning. But in the remoter Dravidian area of the south, the land of Tamil and Malayālam, we find in Old Tamil, as early as the middle of the 1st millennium A.D. a sharp awareness among poets and others of the distinct entity of Tamil from Sanskrit and the northern dialects. We have a Tamil Śaiva saint addressing the Supreme Diety in the form of Śiva in these terms (*Tirunāvukkaraśu Swāmigal Tēvaram* :

c. 7th century A. D.) :

*Āriyan kandāi*  
*Tamilan kandāi*

"Thou art the Aryan  
Thou art also the Tamil !"

meaning that Sanskrit as the language of the Aryan from the North and Tamil as the language of the South are both from God. The same sage has also: *Āriyan Tamilodisai-y-ānavan* "as He is an embodiment of Sanskrit and Tamil and the music of both". There was thus in the oldest period of Tamil no antagonism towards Sanskrit or the Aryan's language but there was accommodation for it, and separate entity was conceded to Tamil as to Sanskrit.

But, in later times, orthodox (i.e., Brahmanical orthodox) scholarship sought to find in Tamil just a dialect of the Aryan language—a kind of Drāviḍa Prākrit, which gave rise to Old Tamil. And now, owing to political and other reasons, the pendulum has swung to the other end and some ardent Tamilophils are trying to derive Sanskrit and the Aryan speech from Old Tamil.

Descriptive grammar in Dravidian languages started fairly early. The oldest Tamil, Kannada and Telugu grammars, beginning with the Tamil *Tolkāppiyam*, belonged to the early centuries after Christ, if not slightly earlier. On the whole, the general feeling of people within the orbit of North Indian (Ganga) civilization and religion was that Sanskrit was the language of the Gods and the source of all human speech, including the Dravidian. This was just like Christian Europe, in medieval times, believing that all languages originated from Hebrew, the language of the Old Testament.

A more rational approach to the question—the genetic approach—was one of the discoveries of modern science, which dawned upon the intellect of Europe and was quickened by the discovery and study of Sanskrit from the last two decades of the 18th century. The foundation of Indian Philology, and of the Science of Linguistics as a whole, was the immediate result of this discovery and study of Sanskrit by European scholars who came to India—missionaries and others. We have to mention, among the pioneers of Sanskrit studies, the names of three Englishmen—Sir William Jones (1745-94), Sir Charles Wilkins (1750-1836), and Henry Colebrooke (1765-1837).

Sir William Jones with some of his scholar friends founded the Asiatic Society in Calcutta in 1784. A great classical scholar who had already studied oriental languages like Arabic and Persian, he delved deep into Sanskrit. It was Sir William Jones who suggested the genetic connection between Sanskrit and Greek and Latin, Irānian and Germanic as well as Celtic; this led to the establishment of the Comparative Linguistics of the Indo-European languages, which sought to find out the common source for all these languages. Sir William Jones was also responsible for some of the first translations of Sanskrit literary masterpieces and other

important works into English, such as the *Sakuntalā* and the *Manu Samhitā*.

Sir Charles Wilkins published his English translation of the *Bhagavad-Gītā* in 1784, and this work had an appreciative introduction from Warren Hastings. So, Sanskrit and allied linguistic studies started with a translation of one of the greatest philosophical classics of the world into English. Colebrooke was the first European scholar to bring out a grammar of the Sanskrit language, published in Calcutta in 1805; it helped in spreading the knowledge of Sanskrit in Europe. During the first two decades of the 19th century, when the serious study of Indian languages started, the Baptist missionary William Carey of Serampore and others came to realize that the languages of North India were generally derived from Sanskrit and were related to each other, while the Southern languages represented a different speech-family. This in itself was a great step forward in the study of Indian languages.

In 1856, Robert Caldwell established the separate existence of a Dravidian speech-family in South India, as opposed to the Aryan family in the North. Max Müller, about that time, separated the Mundā languages as members of a family distinct from both Aryan and Dravidian; and C.J.F.S. Forbes brought in the question of the connection between Khāsi and the Mon-Khmer languages and Kol or Mundā. And the pioneer researches of Brian Hodgson and others made it clear that we have in India languages of a fourth speech-family—the Sino-Tibetan.

In this way, the hundreds of languages and dialects which were to be found in India and Burma were brought under one or the other of Four Great Speech-families : (i) the Aryan, or Indo-European; (ii) the Dravidian; (iii) the Mundā or Kol as a member of the Austro-Asiatic branch of the Austric family of languages; and (iv) the Sino-Tibetan. Bit by bit, from the middle of the last century, progress in our knowledge of the various languages of these four groups enabled the scholars to make a correct classification with a proper nomenclature.

The pioneers in this line were Sir Erskine Perry and R. A. S. Stevenson (1853). It was, however, in 1867 that John Beames brought out from Calcutta his first noteworthy work, *Outlines of Indian Philology*. Before attempting a classification of the languages of India into the distinct families to which they belong, it was necessary to make studies of individual languages for the required speech-material. William Carey and his colleagues at Serampore undertook the study of a large number of dialects and languages of North India, with the purpose of making the Christian scriptures available to the masses of the people in their own

speeches. Thus Carey, the greatest of these linguistic scholars among missionaries, brought out grammars of a number of Indian languages, beginning with Bengali, and also translations of portions of the Scripture, even in out-of-the-way speeches like Braj-bhāṣā. His grammars of Marāṭhī and Panjābī are pioneer works.

Slightly earlier than Carey's was the linguistic work which had started in the College of Fort William in Calcutta. This institution was intended to teach Indian languages, including Persian and Arabic, to the British administrators and military officers who came from England to serve the East India Company. Under the stimulus offered by its Principal, John Gilchrist, prose literatures in Bengali, Hindī and Urdū came into being, and Indian scholars like Mrityunjay Tarkalankar, Tarini Chand Mitra, Lalluji Lal, Sadal Misra and Mir Amman made their contributions. The establishment of the printing press in India, bringing out books and papers in Bengali, Nāgarī, Urdū, Oriyā and other scripts, gave a great impetus to the study and recording of Indian languages. The printing press was also a great ally in encouraging the study of Indian languages in important missionary centres like Hoogly, Serampore, Goa and Madras. The history of the printing press in India, and of the art of printing in the different alphabets, forms one of the ancillary studies in Indian Linguistics. Thus, with the commencement of the 19th century the study of individual languages with a comparative study of various languages was taken in hand. It must be said with a deep sense of gratitude that certain Indian speeches which had never before been reduced to writing first found an alphabet and a literary expression through missionary endeavour.

Individual scholars went on extending the horizon of this knowledge by writing grammars of the more important modern Indo-Aryan languages, as also of Dravidian; and sometimes they essayed historical and philological studies. Following the lines of the first work of comparative grammar for the Dravidian languages (published by Robert Caldwell in 1856), John Beames issued his *Comparative Grammar of the Modern Aryan Languages of India* in three volumes in 1872, 1875, and 1879, and A. F. R. Hoernle brought out his grammar of the Gaudian languages in 1880. Ramkrishna Gopal Bhandarkar, an eminent Sanskrit scholar, delivered his Wilson Philological Lectures in 1877 before the University of Bombay. These lectures, a contribution of permanent value to Indian linguistics, gave the first consistent historical account of the development of the Aryan speech in India in its three stages of Sanskrit, Prākrit with Apabhramśa, and Bhāṣā (or Old Indo-Aryan, Middle Indo-Aryan, and New Indo-Aryan). The philological enquiries into the development of Indian languages

were continued by individual scholars like E. Trumpp (Sindhi), S. H. Kellogg, J. T. Platts and Charles J. Lyall (Hindustāni), Yates, Shyama Charan Sarkar and Nichols (Bengali), Brown (Telugu), Graul and Pope (Tamil), Kittel (Kannada), Gundert (Malayālam) and Grierson (Maithilī and Kashmīrī). Besides, grammars of the less known or less advanced languages such as Santālī (Skrefsrud) and the Bihāri dialects (Grierson) were also published. Standard dictionaries of the various Modern Indian Languages were prepared.

Still we were far from arriving at a meticulously correct statement with regard to the languages of India—a statement based on a very close study of materials from the various languages and dialects, obtained first-hand and in a systematic manner. While individual or piecemeal work in the different languages was continuing as before, one great and comprehensive work on the Survey of the Indian Languages was sponsored by the British Government in India, following a resolution which was taken at the International Congress of Orientalists in Vienna in 1886. This resolution requested the Government of India to take up a complete linguistic survey under the direction of Sir George Grierson. Grierson may well be called the Organiser (if not the Founder) of systematic studies in Indian linguistics. From the 1880's up to 1941, when he died, Grierson carried on investigations into Indian languages, and through a series of 20 volumes of his *magnum opus*, the *Linguistic Survey of India* (1903-1927), he drew for scientific study the linguistic map of the country. A pioneer work, it was naturally not free from deficiencies. Future generations of scholars will be in a position, with more precisely attested facts and better methods at their disposal, to correct or amend many of Grierson's views. Even so, the foundations laid by him will endure. Indeed, a classification of the Indian languages will have to base itself, with modifications, on the great work of Grierson, until a more up-to-date work than the *Linguistic Survey* is available.

## 2. *Languages of India*

According to Grierson, India has 179 languages and 544 dialects. But this number has to be taken with a good deal of reservation. Of these languages (the separate enumeration of the dialects is irrelevant, since they also come under "languages"), 116 are small tribal speeches of the Tibeto-Chinese speech-family; they are found only on the northern and north-eastern fringes of India

and are current among less than 1% of the entire population of the country. Nearly two dozen more are, likewise, insignificant speeches of other language groups; or they are languages not truly belonging to India. The Constitution of India in its Eighth Schedule recognizes 14 languages, as follows: Assamese, Bengali, Gujarātī, Hindi, Kannada, Kashmīrī, Malayālam, Marāthī, Oriyā, Panjabī, Sanskrit, Tamil, Telugu and Urdū. Hindi has been given the status of India's *official language*, along with English. Sanskrit, included in this list, is no longer a spoken language, though it has great importance even today. The speakers of certain other languages left out of the Eighth Schedule are eager to have them recognized. There is Sindhī, the language of a refugee population of over 700,000. Rājasthānī, Maithilī and Nepālī speakers also want their languages to be placed on the list. Further there are languages outside the two main families of Aryan and Dravidian—Santālī, Mundārī and Ho, as well as Maṇipurī and Khāsi, besides the Dravidian, Tuļu and Gonḍī. We are not anyhow concerned here with the Eighth Schedule. We have to consider the numerous forms of speech current on the Indian soil, each with its distinctive character. The Eighth Schedule does not recognize any of the languages belonging to the Austric and Sino-Tibetan groups, because of their numerical as well as cultural unimportance. Santālī, however, is spoken by nearly 3 million people and has a noteworthy literature of myths, folklore and songs. Mundārī, too, is a fairly well-cultivated speech. And the same thing can be said also for Maṇipurī. Besides, many people think that English, considering its importance in India, should be included in the list.

Among the four language-groups which were established in India in very early times, the Aryan speech-family was the last to come—it was preceded by the Dravidian, Sino-Tibetan and Austric. In the evolution of the Indian people and of Indian culture, there has been an intermixture of races, languages and the various cultural *milieus*. Although the Austric and Sino-Tibetan languages are now confined to small populations, they have had their share in developing or modifying the other languages. The Dravidian and the Aryan speeches have, of course, been the most important of all; after the Aryan, the Dravidian was the first to develop literature. The other groups had no written literature until long after. There has been a good measure of interaction among these languages. The Aryan has been profoundly modified by the Dravidian, and vice versa; and that applies to other languages as well. This kind of linguistic interaction has given rise, after 3,000 years of free play, to a Common Indian Type for the modern languages of all the four families of speech, through the evolution of a

certain amount of similarity in phonetic structure, morphology, and above all, syntax and vocabulary. Whether they belong to the Aryan or the Dravidian, the Austric or the Sino-Tibetan groups, modern Indian languages show certain very important resemblances. That is because they share in a common or pan-Indian character, evolved through the racial and linguistic intermixture which has been at work since the beginning of history.

### *3. Linguistic Substratum*

Although linguistic science had its beginnings in India during the first half of the 1st millennium B. C. the average Indian, like the average individual anywhere else, does not possess a keen linguistic sense. Commonplace generalities are usually supposed to be adequate. To understand the effect of interrelation between the various languages and dialects in each of the four linguistic families, a digression into their early history will be helpful.

First, let us take note of the Aryan family, which is numerically and culturally the most important in India. In undivided India, over 73% of the Indian people spoke languages belonging to the Aryan family. Dravidian came next, representing 20%. We have only 1·3% for the Austric languages, and still less for the Sino-Tibetan languages, a mere 0·85%.

It is not known how and when these language families moved into India. Before their advent, there was the language of the Negroid peoples, who pioneered into India from Africa along the Asian coastline, probably before the 6th millennium B.C. But on the mainland of India nothing has remained of their language, the original Negroid peoples having been killed or absorbed by subsequent immigrants. It is also likely that, in ancient times, peoples speaking languages belonging to speech-families other than the four mentioned above might have come to India. At least one other speech-family, not properly spotted so far, was represented by some languages which were current at one time in India but are now lost—they left some influence on other languages which came in contact with them.

Thus, in the languages of the three main families spoken today, Aryan, Dravidian and Austric (Kol or Mundā), there has been much mutual borrowing. It is easy to spot a Dravidian or Austric borrowing in an Aryan language; it is possible also to spot an Austric borrowing in Dravidian, and vice versa; Aryan borrowings in the other two families are also easy to find out.

But there is still a mass of words, e.g., in Aryan, Dravidian and Austric, which seem to form a group by themselves—they do not belong to any of the three language groups, nor to the other fourth linguistic family in India, the Sino-Tibetan. This is a problem in modern Indian Linguistics. There is one dialect spoken in Berār, the Nahalī, which seems to present in its vocabulary a large survival of the unidentified fifth language-group. This problem of a substratum from a family of languages now extinct is, however, one which concerns the linguistic investigators primarily.

#### *4. Linguistic History of India*

A general statement of the linguistic history of India will be helpful before we consider the members of individual families separately. A Negroid people, originally from Africa, first established their language on the soil of India. The Negroids were in an Eolithic stage of primitive culture, and they were food-gatherers rather than food-producers. Their culture could not have been of a high order. They had, nevertheless, spread over considerable parts of India. Traces of Negroid physical characteristics are found in the art of Western India, at least up to the middle of the 1st millennium A.D. Negroid tribes are still found in parts of the Tamil country—the Irulas, Kādars, Paniyans and Kurumbas. Remnants of the ancient Indian Negroids, they have lost their language and speak forms of Tamil. There are a few hundred Negroids also in the Andaman Islands—they are probably descendants of the Negroids who came along the coastal lands through Bengal into Assam and then by canoes into Burma. Anthropologists have discovered traces of Negroid characteristics among the Mongoloid or Tibeto-Burman speaking hill peoples of Assam State, like the Nāgās.\* From Burma they probably crossed, in prehistoric times, the 320 km. stretch of sea which separates the North Andaman Islands from Cape Negrais in South Burma. Other groups of Negroids passed down to Malaya, where we still have the Semangs, a Negroid people who now speak Indonesian. Negroid groups are also found in the Philippines (the Aetas), and in distant New Guinea there are the Papuans, also Negroid.

The exact connections, linguistic and otherwise, among these peoples—the South Indian tribes, the Andamanese, the Semangs, the Aetas and the Papuans—have not yet been found out. Even

\* The Bengali and Hindi form “Nāgā” has been used here and elsewhere.

the question of the origin of the Andamanese has not been unanimously decided. Some anthropologists hold the view that the Andamanese are the outcome of a backwash immigration from the islands of Indonesia, which, as already mentioned, still preserve a Negroid population. As for the Negroids on Indian soil, some of their religious notions and a few of their words may have survived as substrata in the cults and beliefs as well as the languages of the later Austric, Sino-Tibetan, Dravidian and even Aryan peoples. For instance, the word in Bengali for the flying animal, the bat, is probably a survival from a word occurring in the old speech of the Negroids; the modern Bengali word *bādūr* from an earlier *bād-ad-i*, with a basic element *bād*, recalls a group of similar words in the Andamanese dialects and in Semang.

Chronological sequence in the matter of the advent into India of the three groups other than Aryan has not been established. It is not clear as to who came first—the Austrics, Sino-Tibetans or Dravidians. But the fact remains that all these three groups were in India when the Aryans came. We can dispose of the Sino-Tibetans first. They represent, ethnically, various types—long-heads and middle-heads, with different formations of the face. But basically they belong to the Mongoloid type—yellow colour of the skin, oblique eyes, high cheek-bones, straight hair, comparative absence of hair on face and on body, and medium height. The original Sino-Tibetan speakers appear to have become characterized with their basic language at least 4,000 years before Christ in the area to the west of China, between the sources of the Yangtze and the Hwang rivers. There they developed a language which ultimately became the source of Chinese, Tibetan, Burmese, and possibly also Thai, though the genetic connection of Thai with the Sino-Tibetan family is now being questioned.

Not only the language, but also certain ideologies and bases of thought and culture appear to have originated among the primitive Mongoloid people in this area—ideologies and bases which have survived or have further developed among their descendants, pure or mixed, in East Asia, in Indo-China and even in India. It is very likely that these peoples—the Tibeto-Burman speaking Mongoloids with yellow complexion—came to be known among the Vedic Aryans as the *Kirātas*. Their presence is attested through literary evidence (as in the *Yajur Veda* and the *Atharva Veda*) by about 1000 B.C. The *Kirātas* are also mentioned in other early Sanskrit works like the *Mahābhārata* and *Manu Smṛitī*. In the Mohenjodaro remains, among various artifacts, at least one little terracotta head of a Mongoloid type has been discovered. The

Mongoloids penetrated deep into the heart of India. Among the Gond people (who speak Dravidian) there are Mongoloid traces. In the deserts of Western Rājasthān, towards Sind, there are settlements which appear to have been originally associated with the Kirāta peoples. Tibet, according to an old Tibetan tradition, was colonized by the ancestors of the present-day Tibetans about the middle of the 1st millennium B.C. In the *Mahābhārata*, the historical core of which probably goes back to the 10th century B.C. there are suggestions that the Sino-Tibetans, known as the Kirātas, belonged to the Brahmaputra valley of Assam. The Mohenjodaro finds would take them to at least 3500 B. C. some 2,500 years before the advent of the Aryans in India. These Tibeto-Burmans came to occupy the Southern Himālayan slopes, and the plains as well as hills of Assam. In the *Atharva Veda* we find mention of a Kirāta girl picking herbs on the slopes of mountains, probably in the Himālayan foot-hills; a mountain cave is looked upon in the *Yajur Veda* as the proper habitation for a Kirāta.

The Kirāta contribution to Indian culture was not as extensive as that made by each of the other three groups. The basis was Dravidian and Austric, to which very important Aryan elements were added. The Kirāta influence in the amalgam of Aryo-Dravido-Austric culture, which is Indian culture or Hindu culture, was not very far-reaching. The role of the Sino-Tibetan languages and their present position also are not very significant.

Between the Austrics and the Dravidians, the former possibly represent the earlier group. According to some scholars, the Austrics had their origin in Indo-China and South China; they spread east into India and south into Malaya, and then passed into the islands beyond.

**The Austric group** Another view, which is more recent, is that the Austrics are a very old offshoot of the Mediterranean people who came into India from the west, probably even before the Dravidians. This must have been in a prehistoric age, before the characterization of the Mediterranean people, *qua* Mediterranean, with light or brown skins, long heads and typical Mediterranean features. The Austrics of India represent a race of medium height, dark (and in some cases even black) complexion, dolichocephalic in their cranial structure, with the nose rather flat, but otherwise regular features. Miscegenation with the earlier Negroids may be the reason for dark or black pigmentation of the skin, and flat noses. These Austrics have supplied the large basic element in the population of India, and Austric traces are found particularly among the lower or submerged classes of people in the country.

According to this theory, Austric tribes spread over the whole of India, and then passed on to Burma, Malaya and the islands of South East Asia. In Burma and Indo-China they mingled largely with the Mongoloids. Originally Austric groups, without Mongoloid mixture, found their way into Ceylon (where they still survive as the Veddahs), and they passed also into Australia, where their descendants are the Australian aborigines. The Austrics form the bed-rock of the Indian people. On the soil of India, they developed cultivation with the digging stick and the hoe, but did not know the plough drawn by oxen. They cultivated rice, vegetables like brinjal and gourd, and condiments—ginger, pepper, turmeric. They spun and wove cotton into yarn and cloth, domesticated the fowl, raised pigs, and were probably responsible for the training of the elephant. Indian toponymy is at least in part Austric, which shows how they had spread all over the country. They appear not to have developed any city civilization but lived in big villages. Some of them continued to lead the primitive life of a hunting people, in the hills and forests of Central and Eastern India. But on the great riverain plains they evidently formed settled agricultural communities. When the Dravidians (and after them the Aryans) came, they mingled with the Austrics, and gradually a new people was formed by the beginning of the 1st millennium before Christ. Austric speech influenced Dravidian and Aryan. In the plains, Austric has been very largely suppressed by Dravidian and Aryan, but Austric languages survive in the less easily accessible hills and forests of Central and Eastern India. In the Himālayan slopes, Austric languages have deeply modified the Sino-Tibetan dialects—these took over some Austric features. In Assam, one Austric language survives among the Khāsis, who are largely Mongoloid in race but Austric in speech.

Next we have to consider the Dravidians, who are said to have come from Asia Minor and the Eastern Mediterranean. They

**The Dravidian group** were a Mediterranean people, of the same stock as the peoples of Asia Minor and Crete, and the pre-Hellenic people of Greece (the Aegeans). The Dravidians of India were thus originally a branch of the same people as the pre-Hellenic people of Greece and Asia Minor. The exact affiliation of Dravidian with the language of the Eastern Mediterraneans has not yet been settled. But some common lexical elements are noticeable. Certain religious notions and ideas as well as cults and practices among the Dravidian people of India have strong West Asian and Mediterranean affinities. The Dravidians in general are a long-headed people like the Mediterraneans. The city civilization of Sind and Punjab and other

parts of India appears to be Dravidian, and therefore connected with West Asian. The Dravidian languages are now found in solid blocks in the Deccan and in South India, where they have their separate existence in spite of strong inroads upon them by the Aryan speech. There is an Austric element in the Dravidian languages, just as there is a strong Dravidian-cum-Austric substratum in the Aryan speeches of India.

These Dravidian languages resisted the inroads of the Aryan languages in the South. In most places in North India they gradually went to the wall. The Aryan language, the flexible and forceful speech of a virile and well-organized group of conquerors, swept everything before it. This was easy, since there was no linguistic unity among the pre-Aryan people who spoke a number of heterogeneous languages belonging to the three distinct families of Sino-Tibetan, Austric and Dravidian. But even now the Dravidian languages are next in importance to the Aryan, and some of them have literary output of a very high order. Most prominent among these is, of course, Tamil. The beginnings of a written literature in the Dravidian languages date back probably to the closing centuries of the 1st millennium before Christ. But Dravidian does not appear to have been cultivated much before the early centuries of the Christian era. Literary endeavour became exceedingly fruitful among the South Dravidians from the first few centuries after Christ. By the middle of the 1st millennium after Christ, the more important Dravidian languages were fully established as languages of well-organized and cultured communities—Old Tamil, including the future Malayālam, Old Kannada and Old Telugu.

Finally, we come to the Aryans and their languages. The Aryan speeches of India, beginning from Vedic Sanskrit, their oldest form, have been the great intellectual and cultural heritage of India. They form our mental and spiritual link with the European world, on the genetic side; and with the world of South East Asia and East Asia, on the cultural side, through Buddhism and Brahmanism. The modern Indo-Aryan languages of India are near or distant cousins of the Indo-European languages outside India, like Persian, Armenian, Russian and other Slav languages; Greek, Italian, French, Spanish and other Latin languages; German, English, Norwegian and other Teutonic languages; and Welsh and Irish among Celtic languages. The Indo-European speech-family is today the most important in the world. With the exception of the various *languages* within the orbit of Chinese (the so-called *dialects* of Chinese or Han), Japanese, Indonesian or Malay, and Arabic, all

the main languages of the world, and the most important culturally, are Indo-European. And all these languages are descended from a common source-speech, the "Primitive Indo-European", which flourished about 5,000 years ago.

The history may be reconstructed as follows. Over 5,000 years ago, in the dry grassland to the south of the Ural mountains, there lived a people among whom the Primitive Indo-European Language became characterized. Among them also developed the primitive culture of the semi-nomadic Indo-European people, which was the most ancient form of Indo-European culture. These people had already tamed the horse; their first great contribution to civilization was to make this quick and convenient means of locomotion available to man. They were partly agricultural and partly pastoral. Their religion consisted mainly of the worship of the beneficent forces of nature. The social order they built up endured, in many respects, for thousands of years, even when in alien surroundings. Their society was patriarchal rather than matriarchal.

Recently, the reading and study of the ancient Hittite speech of Asia Minor of c. 1400 b. c. which has been proved to be connected with Indo-European, have enabled scholars to postulate an earlier or anterior stage of development of Primitive Indo-European as a language. This stage has been given the name of *Indo-Hittite*. But that is a different story. The Primitive Indo-Europeans, owing either to increase of population or to pressure from neighbouring peoples, or for both these reasons, are believed to have left their ancestral homes in search of new places to live in, to the west and south-west of their original homeland. Groups of them went west through present-day Russia and Poland into Central and Northern Europe, as also into Southern Europe—into the Balkans, Greece, Italy. Another group, probably the first to leave the ancestral homeland, went south, passed through the mountainous regions of the Caucasus, and came down to Northern Mesopotamia (*Irāq*) by about 2500 b.c. The groups which went to the west mingled with the peoples living there, and became modified in language and culture as well as in physical type. They became transformed later into the Celts, the Germans, the Italians, the Hellenes or Greeks, and other peoples or tribes. The group which went to Northern Mesopotamia appears to have stayed there for some centuries up to about 1400 or 1300 b.c. and some of the tribes of this group, like the Mada, the Parsa (or Parswa) and the Kasi trekked into the lands of the East and came to Southern Mesopotamia and *Irān*. Here, they were strongly influenced by the civilization as well as religion and mythology of the Assyrio-Babylonian-

ans, and perhaps of the earlier Sumerians as well. In Irān they settled for some centuries, pushed further towards the East, and finally found themselves in India.

These Indo-Europeans (the group which had been established in Mesopotamia) have been specifically named by linguistic scholars as *Aryan*. They are also called *Indo-Irānians*. When exactly these Aryans came into India is not known. It is usual to place this event somewhere about 2000 B.C. but that is too early a date and does not fit in with other known facts of ancient history. Some of the Aryan tribes, already settled in Northern Mesopotamia, stayed on there and became ultimately merged among the surrounding peoples, the Assyrio-Babylonians and others. From some old documents written in the Assyrio-Babylonian language, which have been discovered in Mesopotamia and Eastern Asia Minor, we have been able to trace a few personal names and words of the language used by these early Aryans of the period between 2000 to 1300 B.C. These names and words show a language older than Vedic Sanskrit and the oldest portions of the Avesta. In fact, here we get Old Indo-Irānian or Old Aryan.

At the same time, after 1500 B.C. we have in all likelihood the advent of the Aryans into India. When they passed on from Irān into India, they found evidently the same class of pre-Aryan peoples living throughout the whole of this tract. That is why they were not conscious of entering into a new country. The people who lived in this wide land of Eastern Irān and North-western India were known to the Indo-Aryans as *Dāsa* and *Dasyu*—names echoed by the Irānian equivalents, *Daha* and *Dahyu*. The Aryans, when they came into India, did not find themselves in a no-man's land. They encountered highly civilized, settled communities who had big towns with fortifications, brick structures, and many of the amenities of quite a high type of civilization—baths, masonry drains, and houses more than one storey high. The Aryans (whose chief god Indra was named *Puran-dara* or "the Destroyer of Cities") are believed to have been responsible for destroying the high city culture which they found in North-western India. What possibly happened was that the Aryans established themselves among the pre-Aryan peoples who spoke Dravidian, Austric, and Tibeto-Burman languages. Their first home in India was Western and Northern Punjab. Slowly they spread into the Ganga valley in the east.

Aryan expansion in the south seems to have been resisted for a time—in Sind by the pre-Aryan peoples who had built cities in that area. As the Aryan tribes settled down, a racial as well as linguistic and cultural miscegenation started. They had brought

with them their language in which their wise men and priests composed their songs and hymns. This was the nucleus of the literature of the Vedas—*Rg*, *Yajur* and *Atharva*. During the 10th century B.C. according to tradition, Vyāsa, who was three-fourths non-Aryan, is believed to have compiled the four Vedas from a mass of oral literature. We have in the Vedas of the 10th century B.C. the oldest specimens of the Aryan language in India. As there was more and more intermixture with the non-Aryans, larger and larger groups of the latter began to take up the Aryan languages; and thus during the next few centuries, on the terrain of North India, we have the rapid development of an ever-increasing Indian people, formed from an intermixture of Aryan and Dravidian, Mongoloid and Austric. They had taken up the Aryan language as their speech and were building up a great culture, an amalgam of the native pre-Aryan cultures of India and the Vedic culture of the Aryans. The Aryan language began to change, along its natural line of development and also through the influence of the non-Aryan languages, the speakers of which were giving up their own tongues and adopting the Aryan. The changes in the Aryan speech through these two processes ushered in the second stage in the history of the language. This was the *Middle Indo-Aryan* (MIA). The first stage with Vedic Sanskrit, the *Old Indo-Aryan* (OIA) stage, started roughly from the time of the first advent of the Aryans into India—about 1500 B.C. to about 600 B.C.; by the latter date the Aryans with their language, pure as well as mixed, had spread as far east as Bihār, and the whole country from Afghānistān to Bihār had become Aryanized in Speech.

Subsequent centuries show further expansion of the Aryan language and its still further development or modification—in Phonetics, in Morphology, in Syntax and in Vocabulary. The Middle Indo-Aryan stage in the history of the Aryan language in North India and the Deccan continued up to about 1000 A.D. During this long period of over a millennium and a half, 600 B.C.-1000 A.D. the Middle Indo-Aryan speech showed some distinct strata in its development. First, we have *Old* or *Early Middle Indo-Aryan*, represented by Pāli, the Aśokan Prākrits and a few other specimens, which extended from 600 B.C. to 200 B.C. Then we have the next period of Middle Indo-Aryan, when certain far-reaching phonetic changes came into full play; this we call the *Transitional Middle Indo-Aryan* period, roughly from 200 B.C. to 200 A.D. Then comes the *Second Middle Indo-Aryan* stage or the stage of Prākrit proper, from 200 to 600 A.D. or a little later. Finally, within the Middle Indo-Aryan, we have the *Third Middle Indo-Aryan* or *Late Middle Indo-Aryan* stage, also called the *Apabhraṁśa* stage, from 600 to

1000 A.D. During this stage there was a gradual transformation of Middle Indo-Aryan into *New Indo-Aryan* (NIA), which began to develop from 1000 A.D. The process has continued down to our times.

When the Aryans first came into India, there were the dialects associated with their various tribes. But we do not have any precise information about them. From the evidence of the *Rg-Veda* it is clear that there were at least three distinct dialects of the Old Indo-Aryan speech. In the First Middle Indo-Aryan stage, the language as it spread over a vast area along the riverain plains split up more and more into fairly recognizable dialects, each with its own peculiarities. There were a North-western dialect, a South-western dialect, a Midland or Central dialect, and two forms of an Eastern dialect; in addition, there were probably a Southern as well as a purely Western dialect. There might have been a Northern dialect as well, along the Himālayan slopes. These original dialects gradually became stereotyped into the various Prākrit speeches, with distinct characteristics of their own. Thus, what was a single speech in the East, the *Prācyā* speech, gradually became differentiated into *Māgadhi* and *Ardha-Māgadhi*, which were precise Prākrit speeches. Again, the language of the Midland—*Madhyadeśa*—became characterized as *Saurasenī*, and possibly also as *Āvanti*. The North-western speech was known in Sanskrit works as *Udīcyā*: and the North-western Prākrit has also been given the name of *Gāndhārī*, by some modern scholars. Connected with this was the Northern Indo-Aryan dialect which became established in Central Asia in Khotan (Kustana) and elsewhere. Then there was a dialect in the West, *Kekaya*, and one in Sind, *Vrācada*; further, there was a speech in the South, in Mahārāshtra. Out of these, the Middle Indo-Aryan dialects of the second and third periods became modified into the Modern Indo-Aryan speeches.

The Modern (or New) Indo-Aryan speeches can be classified into various groups which are geographically contiguous and have the same genetic origin. The present delimitation of India into what have been called "linguistic States" represents more or less the language map of India (with the exception of Pākistān). There is an anomaly, however, about the Hindī-speaking or Hindī-using States—Bihār, Madhya Pradesh, Uttar Pradesh, Rājasthān and Himāchal Pradesh, and also Punjab. In these regions, various languages and dialects have all been brought under the aegis of "Hindī"; and without considering the spoken languages in Garhwāl or Kumaun, Magadha or South Bihār and Bastar, Punjab, and Rājasthān, the entire region has been labelled as the *Hindī area*.

### 5. *The Indo-Aryan Languages*

We may take note of the Aryan languages first. They may be classified along the lines indicated below. The figure after the name of a particular language or "dialect" indicates the approximate number of millions speaking it (1931 Census); an asterisk indicates the *Linguistic Survey* estimate. The disagreement between the total of these figures, with 257 millions as the number of Aryan-speakers in undivided India in 1931, is due to the non-inclusion of the Irānian and Dardic speeches in the list given here, which is only for Indo-Aryan. It is also due to the divergence between the census figures and the survey estimates; in some cases, the latter have to be given preference. The following figures may be compared with those given in the *Appendix* to the Census Report for 1951.

- I. North-western group: (1) Hindī or Lahndā or Western Panjābī dialects,  $8\frac{1}{2}$ ; (2) Sindhī (with Kacchī), 4.
- II. Southern group (3) Marāthī 21 (with Konkani, \* $1\frac{1}{2}$ ). Halbī of Bastar has been connected by Grierson with Marāthī, but this has been disputed.
- III. Eastern group: (4) Oriyā, 11; (5) Bengali,  $53\frac{1}{2}$ ; (6) Assamese, 2; (7) the Bihārī speeches, \*37, viz. (a) Maithilī, \*10, (b) Magahī, \* $6\frac{1}{2}$  and (c) Bhojpurī with Sadānī or Chotā-Nāgpurī, \* $20\frac{1}{2}$ . Halbī should come in this group.
- IV. East-central (Mediate) group: (8) Kosalī or Eastern Hindī (in 3 dialects, Awadhī, Baghelī and Chattīsgarhī), \* $22\frac{1}{2}$ .
- V. Central group : (9) Hindī proper or Western Hindī (including "Vernacular Hindustānī", Khārī-Bolī with its two literary forms, High Hindī and Urdū and Bāngarū; and Braj-bhāṣā, Kanauji and Bundeli), \*41; (10) Panjābī or Eastern Panjābī,  $15\frac{1}{2}$ ; (11) Rājasthānī-Gujarātī—(a) Gujarātī, 11; (b) the Rājasthānī dialects like Mārwārī, Mewātī, and Jaipurī, and Mālavī, 14; and (c) Bhili dialects, 2; besides Saurāṣṭrī in South India, and Gujarī in Punjab and Kashmīr.
- VI. Northern or Pahārī or Himālayan group: (12) Eastern Pahārī : Gorkhālī (Khas-Kurā, Parbatiyā or Nepālī), ? 6; (13) Central Pahārī : Garhwālī and Kumāunī, \*1; and (14) Western Pahārī dialects: Chameālī, Kūlūī, Mandeālī, Kiūnthālī, Sirmaurī, etc., \*1.  
[Extra-Indian groups: VII. Sinhalese of Ceylon, with Maldivian; and VIII. The Romani or Gipsy dialects of West Asia and Europe].

We have to note in this context that the Aryan language, as it has developed in Irān and India, includes three groups of speeches—(1) Irānian, (2) Dardic, and (3) Indo-Aryan. Irānian comprises the following ancient, medieval and modern languages : Avestan, as in the Avesta of the Zoroastrians in the two forms of Gāthā Avestan and later Avestan; Old Persian; Middle Persian or Pahlavī in its various forms; the Śaka dialects of ancient and early medieval times, current in Central Asia, South Russia and the Caucasus (under Śaka come the Old Khotani speech, and the connected Ghalchah dialects of the Pamīr plateau which are current at the present day); Ossetish in the Caucasus regions; the various Kurd dialects; Pakhto or Pashtu; Ormuri; Balochi; and modern Persian dialects as current in Irān, Soviet Tadzhikistān, and Afghānistān, including the standard speech of modern Irān. This modern Persian standard language came to India with the Turki and Irānian conquerors after 1000 A.D. and modern Persian then exerted a tremendous influence on the vocabulary of the New Indo-Aryan languages of North India and through them on that of the Dravidian languages of South India as well.

The Dardic group of Aryan or Indo-Irānian comprises a number of speeches, which are current among very small mountain communities living on the frontier between Pākistān Dardic group and Afghānistān and India (in Kashmīr), as well as in North-eastern Afghānistān. The people speaking these languages, before their final conquest and Islāmization by the Afghāns, were called *Kāfirs* or "Infidels" and their languages (or dialects) were in general called "Kāfir dialects". Following Sanskrit nomenclature, these dialects were also known as *Piśāca* dialects, or "dialects of Goblins". The ethnic-linguistic name *Dardic* has now been established and accepted for them. The Dardic speeches fall into three branches: (1) Shīnā, including Kashmīrī (about 1½ millions), Shīnā proper (over 25,000) and Kohistāni (about 7,000); (2) Khowar or Chatrari or Chitrāli; and (3) the Kāfiristān (or Nūristān) dialects, in Afghān territory, like Kalāshā, Gawar-Bātī, Pashai or Laghmāni, Dīrī, Tirāhī, Wāī, Wasi-veri, Ashkun, etc.

In Kashmīr we have Shīnā and Kashmīrī, and some dialects allied to Kashmīrī. Kashmīrī appears to be in its bases a Dardic-Aryan dialect. But it has been very profoundly influenced by Sanskrit and the Prākrits from very early times. Many scholars claim that Kashmīrī is Indo-Aryan rather than Dardic. We have to note that, excepting Grierson and one or two supporters of his view, most scholars consider Dardic to be just a branch of Indo-Aryan. These Dardic dialects are largely on the way to extinction. Kashmīrī,

however, is one of the recognized national languages of the Indian Union. In spite of the severe handicap that it has no proper alphabet now,\* it cannot be ignored and has to be considered as an important Indian language, being very close to the other Indo-Aryan speeches.

The third group of Aryan or Indo-Irānian is Indo-Aryan. This embraces the languages of North India proper and represents the New Indo-Aryan stage, which, as said before, goes back through Middle Indo-Aryan to the Old Indo-Aryan, that is, to the speech of the Vedas.

The genetic relationship among the various Indo-Aryan languages of India may be indicated by the Table in p. 387.

Notwithstanding the views of Grierson about Dardic being a separate group—one of the three—within the Aryan or Indo-Aryan branch of Indo-European, many eminent scholars of the Indo-Aryan believe that Dardic does not form a separate and self-contained group. They think that the Dardic speeches should be classified under Indo-Aryan. This view is maintained by Jules Bloch, Georg Morgenstierne and R. L. Turner. The question has not yet been finally decided. If this view is accepted, Kashmīrī will be an Indo-Aryan language just like Hindi and Bengali.

Most of these New Indo-Aryan languages started their present phase of history after 1000 A.D. To give a brief description of them, group by group, we may treat them in the following order :

(1) *The North-western group* :—Leaving aside the question of Kashmīrī, we first come to Western Panjābī; it includes the North-western language of the western Districts of Punjab and group: gradually passes on to Sindhī from the south of the Western Panjābī Multān District. This is the Old Indo-Aryan speech which has developed in its own homeland; Western Panjābī shows 3,000 years of development in the land of Pāṇini and of the Vedas, and it comes directly from the Old Sanskrit and Vedic speech. Western Panjābī dialects have no common and well-attested name. Various dialectical names, such as Poṭhwārī, Chibhālī, Jaṭkī and Multānī, are used. A common name suggested for this West Panjābī group of dialects is *Lahndā*, or *Lahnde-dī-Boli*, i.e., “the speech of the West (where the sun sets)”. Another common or general name which has been suggested is *Hindkī*. This name has a stronger claim than the other, since the word Hindkī is used by the Afghāns to indicate the Indian dialects immediately to their east,

\*Its old alphabet, the Śāradā allied to Nāgarī, Bengali and other Indian scripts, is confined to a few Hindus in the State and has otherwise fallen into total disuse. The Persian or Perso-Arabic script, as used now for Kashmīrī, is not at all suitable for it. The Roman script as proposed by some Kashmīr scholars would have been the best, but it will not be accepted by the religious leaders of the Kashmīr people.

*Genetic relationship of Indo-Aryan languages*

Old Indo-Aryan (Vedic, Early Sanskrit)

(A) Spoken dialects of OIA

Western and North-western	South-western	Midland	Eastern	Northern	Southern	
[Kekaya, Vrācāda ‘Gāndhārī’] Hindki; Sindhi; Eastern Panjab (strongly influenced by Midland)	[Āvanti, Saurāstṛi, etc.] Gujarāti, Rājasthani, Mālavi (strongly influenced by Midland)	[Sauraseni] Western Hindi (Khari-Boli Hindustāni or Hindi-Urdū) Braj-bhāṣā Kanaujī <sup>b</sup> Bundelī	[Ardha-Māgadhi] Kosali (or East- ern Hindi— Awadhi, Bagheli, Chaitisgarhi) Haloi	[Māgadhi] Bhojpuri Maithili Magahi Awadhi, Bagheli, Chaitisgarhi) Assamese	[Khāṣa] Pāñjari or Himāayan speeches (strongly influenced by Midland)	[Mahāāstri] Marathi Konkani

(B) Literary forms of OIA & MIA

Classical Sanskrit	Pāli	The Literary Prākṛits and Apabhraṇas
Buddhist Sanskrit		

which are slightly different from Panjābī and quite different from Hindustānī (Hindi-Urdū). Western Panjābī, Lahndā or Hindkī does not possess any noteworthy literature. But there is at least one book in Hindkī which goes back to the 16th century—a book of Sikh inspiration, the *Janam-Sākhī*, a biographical work on Guru Nānak. Speakers of Hindkī now use either Eastern Panjābī, or Urdū or Hindi.

(2) Next, we have Panjābī, or Eastern Panjābī. There is no hard and fast border line between the two forms of Panjābī, Western and Eastern. The dialect of the area near Eastern Panjābī about Lahore and Amritsar is looked upon as the standard for Panjābī, which has a fairly rich literature. The Sikh *Ādi Granth*, which was compiled at the beginning of the 17th century and had subsequent additions, is not in Panjābī at all; it is really in a kind of Old Hindi—the Braj-bhāṣā dialect of Hindi and standard Delhi Hindi mixed together with some Panjābī forms and archaic Apabhrāṁśa words and expressions. The Panjābī language is written in the Gurmukhī script, which is allied to the Sāradā script of Kashmīr and to several other scripts of the same type, which are or were current in the Punjab and Kashmīr hills. Muslims generally use the Persian script in writing Panjābī, and Hindus have shown a decided preference for the Nāgarī script. Gurmukhī, Nāgarī and Persian scripts have thus split up a fine language. The question of script has become a bone of contention between Hindus and Sikhs in the present State of Punjab in the Union of India. In its vocabulary and idioms Panjābī has a rich rural flavour. Simple and vigorous, it prefers to use its own native Panjābī words, although there is a large sprinkling of Perso-Arabic vocables, and Sanskrit words are also fairly common, in a modified spelling. There has been, of late, a great deal of literary endeavour in this language, and many distinguished poets and prose-writers have come into prominence during the last half a century.

(3) South of Hindkī or Western Panjābī is the area of Sindhī. The Sindhī language is divided into six dialects: Siraikī, Vicolī, Thareli, Lāsi, Lāri, and Kacchi. Sindhī has a rich literature of ballads which have their origin in stories current in the early centuries of the 2nd millennium after Christ, a short while after the formation of the Sindhi language. But this ballad literature has not been properly preserved or studied. The first classical writer of present-day Sindhī is Shāh Abdul Latif, the mystic poet, popular both among Hindus and Muslims, who lived from 1688 to 1749. There was possibly a Sindhī literature prior to 1000 A.D.; one work from this literature, consisting of a version of the *Mahābhārata* story, appears to have been translated into

Arabic before 1000 A.D. Sindhī is a very archaic language, although it has been influenced very much by Persian. Most of the Hindus of Sind came away to India after the Partition. Sindhī has been given some recognition by the All India Radio.

(4) We now come to the great speech of Northern India, Hindī or Hindustānī. The word *Hindī*, in a rather loose way, now includes all the speeches and dialects current in India Hindī, Hindustānī to the east of Punjab, east of Sind, north of Gujarāt and Mahārāshtra, and west of Orissa and Bengal, and south of Nepāl. Linguistically, within the orbit of Hindī, only these speeches and dialects should come: the dialects of Hindī proper, or, as they are generally described, the *Pachānhī*\* or *Western Hindī* dialects. We have in this group a number of dialects current in parts of Eastern Punjab, Western Uttar Pradesh and Western Madhya Pradesh. They include the following: (a) Kanaujī, (b) Bundelī (c) Braj-bhāṣā, the three forming one sub-group; (d) Vernacular Hindustānī of North-western Uttar Pradesh; (e) Jātū, or Bāṅgarū, to the west of Delhi; and finally (f) Hindustānī proper, the speech of Delhi. This speech of Delhi gradually acquired a tremendous importance during the 18th and 19th centuries.

Hindustānī is thus a dialect of the Western Hindī group. The Western Hindī speeches or dialects fall under two groups : (i) what may be described as the *-au* or *-o* group, and (ii) the *-ā* group. In the first group, a large class of masculine nouns and adjectives, as well as the past tense of the verb, which functions as an adjective qualifying the subject when it is intransitive and the object when it is transitive, have the affix *-au* or *-o*; and in the second class, the characteristic ending is *-ā*. In the first group come Braj-bhāṣā, Kanaujī and Bundelī, and in the second group come Hindustānī (Kharī-Bolī, i.e., both High Hindī and Urdū), the Vernacular Hindustānī of Meerut (Meraṭh) and Rohilkhand Divisions and Jātū or Bāṅgarū. The first group agrees with Rājasthānī and Gujrātī; and the second, with Panjābī in the West and Kosalī in the east. We have thus even in the dialects of Western Hindī a kind of cross-division, where Panjābī and Rājasthānī as well as Kosalī overlap each other. In Braj-bhāṣā, we have *wā-ne merau kahyau nāhīn mānyau*. "He did not listen to what I said" (cf. Rājasthānī *un mhāro kahyo na māno*), whereas in Kharī-Bolī we have *us-ne merā kahā nahīn mānā* (in Panjābī this would be *us-ne merā akkheā nahīn mānneā*). The Kharī-Bolī or Hindustānī speech can be characterized

\*In this chapter, in the transliteration of Indian words in italics, Roman "n" is used to indicate the nasalizing sign (chandrabindu \*) as for example, in Hindī—हँस—*hans* (to laugh) as distinguished from —हंस—*hans* (swan).

among its immediate sisters and cousins as a speech distinguished by its special postpositions and affixes; thus, with these it can be called a *kā-ne-men-par*, *is-us-kis-jis* and *tā-ā-gā* speech. The standard Hindustānī or Kharī-Boli with the above suffixes has become at the present-day the dominant language in India.

On the basis of Kharī-Boli Hindustānī have been built up two literary speeches of great importance: Urdū, and Hindī (or High Hindī). Urdū and Hindī have virtually the same grammar, and the basic words are identical. But in their literary forms they have separated from each other through the script and through the higher vocabulary. Urdū developed under Muslim inspiration, first in the Deccan and then in Delhi; it uses the Perso-Arabic script, and that makes the introduction into it of Arabic and Persian words very easy. In North India, Muslims generally used the same speeches as their Hindu compatriots, and a highly Persianized Urdū was not established before the middle of the 18th century. The earliest Muslim writers in an Indian language, like Bābā Farīduddīn Ganj-Shakar of Punjab (13th century), used an ordinary Indian vocabulary in their compositions. The Hindi poems and riddles ascribed to Amir Khusrav, who died in 1325 A.D. have generally a pure Hindī vocabulary. In the time of Akbar, Abdur Rahīm Khān-i-Khānān wrote in pure Braj-bhāsā. Other writers in Indian languages like Kabīr and Mullā Dāūd and Malik Muhammad Jāyasi used ordinary Western Hindī or Eastern Hindī (Awadhī), in the manner of Hindu writers. The earlier poets of Dakhnī also did not deviate from this tradition. But the adoption of the Perso-Arabic script for the Hindī or Hindustānī language in the Deccan, and the fact that the Muslim writers of this Hindustānī were cut off from the stream of pure Hindī literature in the North, brought about a significant change. There was a move in the direction of greater and greater Persianization of the language and literature in both vocabulary and ideas. Even as late as the beginning of the 18th century, when Wali of Aurangābād, a Dakhnī poet, essayed Delhi Hindustānī or Urdū, his vocabulary was very largely Indian. The inspiration for an Islāmized speech, based on the court language of Delhi, unquestionably came from the South, and it was helped by the Muslim aristocracy and the learned men of the Mughal court, many of whom came from Irān and Central Asia.

Urdū is a truly Indian language. Apart from its cultural words taken from Arabic and Persian, Urdū has always been true to the idiom of the Western Hindī dialect current in and about Delhi and in the "Hindustānī area" (as it is called, in Western Uttar Pradesh). As a literary language, Urdū took its present form by the

middle of the 18th century. It was then the standard speech used in the Mughal court at Delhi, and was known as *Zabān-e-Urdū-e-Mu'allā* or "the Language of the Exalted Court". This literary employment of the spoken language of the ruling Muslim élite was due to co-operation between the poets of the Dakhnī area who came to Delhi from the South, and local Muslim and other scholars who were familiar with Persian; and there was the patronage of the Delhi Court and all its aristocrats, who were mostly of foreign (Irānian and Turki) origin. Officers of the Mughal empire, both civil and military, as well as secretaries and clerks from the Delhi area, helped to establish Urdū in most of the towns of North India as far east as Vārānasi and Patna, Murshidābād and Calcutta, and even Dacca in East Bengal. In Aurangābād and Hyderābād, the Muslim settlers from North India, who spoke the Dakhnī dialect and used it for literary purposes, adopted Urdū (*Shimālī* or Northern Urdū) after 1750. About that date, this "Language of the Exalted Court" acquired the shortened name, *Urdū*, and it became the handmaid of Persian culture in India.

In the days of Mughal decadence, as the Marāthās and the British were coming into power, Urdū became a kind of cultural refuge in North India for Muslim intellectuals and aristocrats and Hindu scholars in Persian. Through Urdū they could cultivate a Persian literary garden on the soil of India. Further, Urdū took the place of Persian in the law courts, inheriting the entire vocabulary of the Persian language in this field, and it held this position in North India for over a hundred years, up to the end of the 19th century and even later. In this role it became a great inheritance from Muslim rule for the British administration. The Hindu intelligentsia took to Urdū studies as a matter of course, since in the schools started in North India with the establishment of British rule, Urdū went hand in hand with English.

Hindu revivalism began in North India in the last decade of the 19th century, when earnest attempts were made to develop

"High Hindī". It was a language almost identical in its grammar with Urdū, but it sought to avoid Arabic and Persian words as much as possible. Urdū has always been ready to absorb any Persian or Arabic word. Hindī, on the other hand, not only retains the old native alphabet of the region, the Nāgarī, but has a preference for native Hindī words as derived from Prākrit, and also for Sanskrit words expressing the higher ideas of life and culture. In its two forms the Hindustānī colloquial language, which furnishes the basic elements for both Hindī and Urdū, has spread over the whole of Northern India, particularly in the cities, and up to Bihār

in the east, Rājasthān in the west, and the Punjab hills, Kumaun and Garhwāl in the north. The Hindustānī speech, which is current as the home-language among less than 40 millions of people (either as Hindī or to a lesser extent as Urdū), has become accepted by over 140 millions as their own language or "mother-tongue". Most of these people usually speak at home Bhojpuri or Gaṛhwālī, Rājasthānī or Panjābī, Kūlūī, or Magahī, or some other language. Hindustānī has thus become the third great language of the world. A good number among speakers of Gujarātī, Marāthī, Sindhī, Oriyā, Bengali and Assamese understand simple Hindi or Hindustānī; and even those Panjābis who are protagonists of their language also use either Hindī or Urdū, usually the latter. In the Constitution of India the Hindi form of Hindustānī has been given the status of the country's official language (side by side with English, for the present). Government patronage of Hindī has been of the greatest help in its development and in the extension of its literature.

This Hindī-Urdū-Hindustānī has the same grammar as the spoken dialects of Western Uttar Pradesh, the areas round about Delhi, Meerut and Sahāranpur. But when we use the term "Hindī Literature", we mean the sum total of the literatures in all the languages and dialects of India current from Punjab to Bihār, and beginning from about 1000 A.D. Thus "Hindī Literature" includes, for example, Canda Baradāī, whose work the *Prthvīrāj Rāsau* is in an artificial jargon made up of Apabhraṃśa, Old Brajbhāṣā, Old Rājasthānī as well as Old Panjābī forms. The works of Sūradāsa, equally regarded as part of "Hindi Literature", are written in pure Brajbhāṣā, which is the language of the area round about Mathura and Gwalior. The works of Tulasidāsa looked upon as the greatest of the early poets of "Hindī", are mostly written in Old Awadhī (or Old Kosalī), the language of the area of Avadh and of the tracts to the south of it. The works of Kabīr, forming unquestionably some of the most significant writings in "Hindī" are composed in a mixed speech showing a grammatical admixture of Brajbhāṣā, Kosalī (or Awadhī) and the Old Delhi speech. The writings of Mīrā Bāī and many other poets of Rājasthān are in a mixture of Rājasthānī with Brajbhāṣā and other Western Hindi dialects. At present even Bhojpuri, Maithili, Garhwālī and Kumāunī are looked upon as "Hindī". This creates confusion as to the nature of Hindī from the point of view of linguistics as well as literary history.

Nevertheless, present-day Hindī-Urdū-Hindustānī, may well be described as the representative language of modern India. It is known as Khaṛī-Bolī, "Standing or Standard Speech". The name *Hindustānī* is derived from Persian, meaning the language that

belongs to Hindustān or North India, as opposed to the Deccan : the forms of Old Hindī speech taken to the Deccan came to be known as *Dakhnī*, the "Speech of the South". There is a difference in meaning or implication in the Indianized form of the word, *Hindusthānī*, where we have the Sanskrit *sthāna* ("place" or "country") for the Old Persian *stāna*. This form, *Hindusthānī*, normally means a language which keeps closer to the native Hindī vocabulary; whereas *Hindustānī* (with-*t*) is frequently identified with the highly Persianized Urdū. *Hindusthānī* (with-*ih*) is the word used in Gujarātī, Marāthī, Kannada, Telugu, Oriyā, Bengali and Assamese, and is occasionally found even among Hindi writers. This differentiation between the Indian form *Hindusthānī* and the Persian form *Hindustānī* should be noted.

The grammar of Hindustānī (as High Hindī and as Urdū) is rather complicated when compared with, for example, some of the languages of the East. It has only two genders. The gender sense in the eastern languages is not at all strong—the gender is only natural, not grammatical, while it must be said that Gujarātī and Marāthī have 3 genders. These two genders are more or less in the style of the gender-system of French, which also has only two. In early Hindustānī, the nouns which belonged to the neuter gender have passed into the masculine group, and gender is often dependent upon the termination rather than the sense. Thus, the Hindustānī *pothī* (a small book), coming from the Middle Indo-Aryan *potthia*, and from the Old Indo-Aryan or Sanskrit, *pustikā*, is feminine—an inheritance in the matter of gender from the Prākrit. As an equivalent of this word, the Perso-Arabic *kitāb* also became feminine; and the Sanskrit *pustak*, neuter in Sanskrit, followed suit in Standard Hindī as feminine. The word *grantha* of Sanskrit, however, retains its masculine gender in its Hindī form *granth*.

In Hindustānī, the verb in the past tense behaves like an adjective. In fact, in its origin it is a past participle adjective. When it is intransitive, it qualifies the subject and undergoes change according to the gender and number of the subject. Thus, for example, *main āya* = "I (masculine) came"; feminine *main āyī*; plural masculine, *ham āye*, plural feminine, *ham āyīn*. *Main-ne ek rājā dekhā* = "I saw one king"; literally : "by-me one king he-was-seen"; *main-ne ek rānī dekhī* = "I saw one queen"; literally : "by-me one queen she-was-seen". So, *main-ne tīn rāniyān dekhīn* = "I saw three queens"; literally : "by-me three queens they-were-seen". This makes Hindī a little complicated. Masses of people outside the Western Hindī area, however, have simplified matters by ignoring this type of construction—the active and the

passive constructions as given above, and also a "neuter construction" (*main-ne rānī-ko dekhā*—where the verb does not change according to the gender of the object; it is just an impersonal way of saying : "by-me with-reference-to-the-queen, it-was-seen"). These various types of constructions were thrown to the winds in a kind of *Bāzār Hindustānī* or popular Hindustānī current outside the Western Hindī area, where people use only one construction : *ham rājā (ko) dekhā*; *ham rānī (ko) dekhā*; *ham āyā*; *ham-log āyā*; "I saw a king", "I saw a queen", "I came", "We came". The grammatical complications of Standard Hindi have, in this way, been smoothed in the colloquial Hindustānī of the masses, but Standard Literary Hindi and the Hindustānī of the people in Western Uttar Pradesh and Eastern Punjab do not take any notice of it.

One great point in favour of Hindustānī is its precise sound-system. The vowels and the consonants are always pronounced in a precise manner: there are no complicated rules of modification of the vowel-sounds, such as we have in Bengali and, sometimes, in Western Panjabī. The consonants are also quite clear; for example, the aspirates of Hindī, *kh*, *gh*, *ch*, *jh*, *th*, *dh*, *th*, *dh*, *ph*, *bh*, *nh*, *mh*, *rh*, *rh* are always fully articulated and there are no modifications of these sounds, such as we find in the East Bengal dialects, in Gujarātī, in Rājasthānī, in Marāthī, in Western Panjabī and particularly in Eastern Panjabī. Hindustānī, as current all over India, naturally has to accommodate itself to the local vocabularies; and the vocabulary of the Hindustānī spoken in the bazaars of Bombay is different from that in the bazaars of Allahābād and Calcutta. The grammar is simplified according to local habits, but on the whole the pronunciation does not present any complications to people outside the *Pachānī* or Western Hindī area; and this has helped the easy acceptance of Hindi as a great palaver speech.

(5) To the east of the Western Hindī area, we have the so-called "Eastern Hindi" group of dialects. The expression

"Eastern Hindī" is not scientifically correct, as it would suggest a language which is something like a dialect of Western Hindī. But, in fact, their grammars differ very much; as much as, for example, Provençal differs from French. A better name, which is now used for this dialect, is *Kosali*; the ancient names of the area where these dialects are now spoken were Kosala in the north and Mahā-Kosala in the south.

The *Kosali* dialects are three in number:

(a) Awadhī or Baiswārī, which has given India the great

medieval poet Tulasīdāsa, as also a large number of other poets and writers; (b) Baghelī to the south of Awadhī; and (c) Chattīs-garhī. The last has no literature worth mentioning, and Baghelī and Awadhī are very close to each other. At present there is very little literary endeavour in the Kosali dialects, and Hindustānī reigns supreme in the Kosali area.

(6) Further east, we have the great Magadhan group of languages and dialects. They come under three classes :

(a) *Western Magadhan*, which comprises Bhojpuri, a great language of Northern India. Its speakers have, however, adopted Western Magadhan Hindi or High Hindi as their language of the school and of literature and public life. There is also Sadānī or Choṭa-Nāgpurī, which is a dialect of Bhojpuri. Western Magadhan is spoken by more than 20 millions. It is through their enterprise that the Standard High Hindi or Hindustānī has spread over a great part of India, and even outside India. Not much literary work is now done in Bhojpuri; nor can it boast of any noteworthy early literature.

(b) *Central Magadhan* :—Within this we have the two speeches.—Maithili, current in North Bihār, and Magahi, current in South Central Magadhan Bihār. They agree with each other very closely. Maithili has a very remarkable literature, and one of its poets, Vidyāpati, who lived about 1400 A.D. ranks among the great poets of medieval India. At one time Maithili literature had considerable influence over both Assamese and Bengali. There is at present some literary activity in Maithili, and a number of Maithili scholars are eager to re-establish their language as an independent literary speech. A similar movement, though not so strong, is noticeable among some Magahi intellectuals. The official language or the language of public life in the Maithili and Magahi areas is Hindi, and to some extent Urdu.

(c) *Eastern Magadhan* :—This includes Bengali, Assamese and Oriyā. The three languages are very close to each other. Bengali is now spoken by over 70 millions two-thirds of whom are in East Pākistān. It has a very extensive early literature, and its modern literature is one of the most advanced in the world. As the language of Rabindranath Tagore, Bengali has attained great distinction. It also has other writers of high eminence. Assamese is current among approximately 3 millions and is the language of the Brahmaputra valley in Assam. It has an independent literary history, and its speakers are proud of their language. Assamese is very much like Bengali. Certain peculiar ways of pronunciation

make the spoken word difficult for Bengalis to follow, but they can easily understand the written word—the script for both the languages is the same, excepting for two letters, both of which are occasionally used in Bengali for scientific purposes i.e., the letters for *r* and *w*. Likewise, Assamese educated people have no difficulty in reading and understanding Bengali. Oriyā, current among nearly 12 millions, is the most archaic of all the Magadhan languages, and has retained many features of the Middle Indo-Aryan. Its literature is quite extensive.

These Magadhan languages have inherited several common characteristics from the Prākrit of the East—the Māgadhī Prākrit as it was current more than 2,000 years ago. In the first instance, there is a tendency among these languages towards a pronunciation of the first vowel of the Indian alphabet, the short *a*, with rounding of the lips; and this gives the characteristic pronunciation of a word like *amar* into something like *əm̥or* in Bengali, Assamese and Oriyā, and also in the other Magadhan languages. Their development has been along the same broad lines. The noun declension has deviated to some extent, and in Eastern Magadhan the common affix for the genitive of the noun is *-ar* (*-ar* in Assamese, *-ar* or *-er* in Bengali and *-ara* in Oriyā); but in the Central and Western Magadhan dialects it is *-k-* (Maithilī *-k-*; Magahī and Bhojpuri, *-ke* : in the earlier stages of all the Magadhan languages both these were to be found). In the Magadhan speeches the characteristic affix for the past tense is *-l-* (for example, Bengali, Assamese, Oriyā past base: *dekh-il-*, Maithilī, Magahī and Bhojpuri form *dekh-al-*), and the characteristic affix for future is *-b-* (Bengali, Assamese, Oriyā *dekh-ib-*, Maithilī, Magahī, Bhojpuri *dekh-ab-*; and there is *-a-t-* affix for some forms of the future in both Maithilī and Magahī as well as East Bengali).

The old Magadhan habit of pronouncing all the sibilant sounds, i.e., *s*, *ś*, *s* (শ, শ, স) as a palatal শ (ঁ) is still the rule in Bengali; in Oriyā it becomes something like *sy*, and in the other Magadhan dialects of the present day the dental *s* (স) pronunciation is common but it is noticeable that in the Kaithi script, in which these speeches are currently written, and which is the script recognized in the law courts all over Bihār, they write *tālavya ś* (শ) and pronounce it as *dantya s* (স). Only in Assamese there was in earlier times the habit of pronouncing all these sibilants as *h*, so that the Sanskrit word *mānuṣa* became *mānuha*, and in modern Assamese these sibilant sounds, when they stand single, are pronounced like the unvoiced guttural aspirant, i.e., the sound of the Persian letter *khe* (x). For example the name *asamiyā* is pronounced as *əkhōmiya* (খোমিয়া), and a Sanskrit word like *vāsudeva*

becomes *bākhudewa* or *baxudew*. Assamese is further characterized by one great peculiarity which is shared by Pārsī, Gujarātī and by the Gujarātī dialect of Surat: there is use of only one set of alveolar (*danta-mūliya*) sounds for both the cerebral (*mūrdhanya*) and pure dental (*dantya*) sounds of Sanskrit and other Indian languages (i.e., त, ठ, ड and त्, थ, द, ध are both pronounced like English t, d, simple and aspirated). For these habits of pronunciation, spoken Assamese sounds very foreign to the speakers of the rest of the Indian languages, although the grammar of Assamese is, in many respects, almost identical with that of Bengali.

Maithilī and Magahī have developed a very peculiar feature in their grammar—in the conjugation of the verb. The verb combines in itself not only certain affixes indicating the subject, but also the object and sometimes the dative of interest. Thus, for example, in Maithilī the basic inflexion of the past tense is *-al-*: *dekh-al*; but we have extensions of this in forms like the following: *dekh-al-i* = "I saw"; *dekh-al-k-ai* = "He saw someone—another person"; *dekh-al-k-au* = "He saw you"—here the subject is non-honorific; but if a respected Brahmin saw another Brahmin, in Maithilī we would say *dekh-al-thi-nhi*; when a Brahmin sees a low caste man, it would be *dekh-al-thī*; and if the Brahmin who has been seen has some connection with the person spoken to, the form would be *dekh-al-th-u-nhi*. If one low caste man sees another, it would be *dekh-al-kai*; and *dekh-al-kau*, if the person seen has some connection with the person spoken to. So in Magahī : *ū okrā nahīn detai* "he won't give to him" (another person), but *ū torā nahīn detau* "he won't give you". This makes Magahī and Maithilī complicated, and even social distinctions have a place in the language.

There was literary cultivation from very early times in four of the six Magadhan languages—Bengali, Assamese and Oriyā, and Maithilī can boast of a very old Bhojpuri and rich literature. It is only in Magahī and Bhojpuri that we find the absence of a strong literary tradition. The Bhojpuri language is spoken round about the city of Vārānasi, which became one of the most important centres of Sanskrit learning and Hindu religion and culture in the whole of India. Bhojpuri-speaking *Pandits*, however, seem to have had little time for their mother-tongue.

The poems ascribed to Kabīr are composed in a kind of speech known as *Sādhukkara-Bolī*, that is, the speech as used by wandering mendicants of North India. It is a mixture of Brajbhāṣā, Kharī-Bolī, and occasionally, Panjabī and Rājasthānī, as well as Bhojpuri and other eastern speeches. But a number of

songs attributed to Kabīr, which are in pure Bhojpuri, have also been found; and closer investigation has shown that behind the Sādhukkara-Boli of many of the current poems there is a core of Bhojpuri. Later on, contiguity with the centres of Urdū and Hindustānī cultures brought Hindī and Urdū to the Bhojpuri people. But the masses speaking Bhojpuri have never given up composing poetry in their own home dialect. There is a large number of very popular songs and poems which pass from mouth to mouth among Bhojpuri-speaking people, and many of them are published in cheap editions from Vārānasi and Calcutta. A cycle of songs in the form of a drama, known as *Bidesiyā Nāṭak*, gives expression to the longings of a young Bhojpuri wife whose husband has gone away to Calcutta to find work; poignant and appealing, this is performed as a song-drama and has wide popularity. The Bhojpuri people take pride in their speech, and when two Bhojpuris meet, they always insist on speaking in their own language. There are already a number of films using pure Bhojpuri which are immensely popular.

The Magahī dialect, likewise, did not have any scope for development since the country of Magadha was often a "cockpit of fighting peoples". The highway to Bengal passes

Magahī through Magadha and therefore frequent wars occurred here between the Muslim invaders of Bengal and the local Hindu chiefs. The area was also the homeland of large sections of pre-Aryan peoples. Gaya, the most important town in the southern region, became an all-India centre of pilgrimage from about the end of the first 1,000 years after Christ, but unlike Vārānasi it did not become a centre of learning—Sanskrit learning in Bihār and Eastern India was the monopoly of Vārānasi and Mithilā. Even so, there is a small body of literary composition in Magahī—the unpublished songs and narrative poems relating to the Ahīr hero Lorik, and versions of the *Rāmāyaṇa* and the *Mahābhārata*.

Maithili, unlike Magahī and Bhojpuri, has always had a vernacular literature side by side with a very extensive study of Sanskrit by the Maithili scholars. Some of the

Maithili outstanding Sanskrit scholars of Mithilā were also poets in Maithili. Vidyāpati composed a large number of beautiful lyrics, and also wrote a drama in Maithili. His influence spread over Assam, Bengal, and, to some extent, over Orissa. In Bengal, a new type of artificial poetic language came into being, the *Braja-buli*. It was an adaptation of Maithili with Bengali grammatical forms, idioms and words. Imitation of Vidyāpati extended the rich Vaiṣṇava literature in Bengal by its

*Braja-buli* lyrics. Rabindranath Tagore himself composed a fine series of romantic and mystic lyrics in this artificial poetic dialect. The Maithili literary tradition persists even today. There are two important societies which bring out editions of Maithili classics and encourage the production of literature in modern Maithili. Enthusiasts of the language want to establish a Maithili University. The Universities of Vārānasi, Patna and Calcutta have given recognition to Maithili.

As already stated, Bengali, Assamese and Oriyā have a continuous literary tradition which goes back to at least a thousand years. Bengali and Assamese in their early literatures converge into a common kind of speech. As a matter of fact, we can speak of a Bengali-Assamese group of dialects; one of them ultimately became Assamese and the others became North Bengali and other forms of Bengali in West and Central, East and South-west Bengal. Several early writers in Assamese have been claimed as Bengali writers, and vice versa. But Assamese is recognized as a language distinct from Bengali for four main reasons. First, Assam was always ruled by its own kings, until its annexation to British India in 1824. The kings were keen patrons of the Assamese language and literature. Secondly, the Assamese upper classes, Brahmins and others, were not linked by social connections with similar classes in Bengal. This is in sharp contrast to the conditions prevailing in Bihār, where the Brahmins, Kṣatriyas and other classes are linked with similar groups in Uttar Pradesh and even in Rājasthān and Punjab. That is why the orientation of the upper classes in Bihār has been towards the western regions. No integration through marriage and other social ties existed between Assam and Bengal. Thirdly, Assamese developed certain peculiarities in pronunciation and grammar—these are not shared by the various forms of Bengali. Finally, the Assamese people have strong feelings with regard to their language and want its separateness to be maintained. Assamese literature received a great impetus from the renowned teacher, Śaṅkara-deva, and his followers; they brought about a Vaiṣṇava revival in Assam. In all these ways the sense of a separate cultural entity for Assam naturally developed.

Early in the 17th century, Assamese produced, as a result of the Sino-Tibetan language of the Ahom Kings influencing it, a unique kind of historical compositions in prose known as the *Buranjis*. In modern times, under the inspiration of Bengal to some extent, Assamese literature has made considerable progress.

Bengali literature started with the *Caryāpadas* dating back to the 10th century A.D. Its beginnings were both Buddhistic and

Brahmanical. Great names in early Bengali literature include: Cāṇḍīdāsa, Kṛttivāsa, Mālādharaṭavasu, Mukundarāma, Kṛṣṇadāsa, Kavirāja, Govindadāsa, and in the 18th century, Bengali Bhārata-candra. From the beginning of the 19th century, Bengali literature entered into its modern phase. The people of Bengal were the first in India to integrate themselves with the currents of world literature. Their creative work was deeply influenced by Western thought and Western concepts. Under the impact of English literature, the Bengali language and its literature made tremendous progress. Rammohun Roy was the great inspirer of modern India. Among the numerous other writers of eminence were Ishwar Chandra Vidyasagar, Michael Madhusudan Dutta, Bankim Chandra Chatterji, Rangalal Banerji, Ramesh Chandra Datta, Sarat Chandra Chatterji and Rabindranath Tagore. There are also others, only less great, who have had their influence on the literatures of modern Indian languages. Most of the outstanding writers of Bengali were good English scholars. The intimate contact of the mind of Bengal with that of Europe through English literature has helped to make Bengali, in the last hundred years, an important vehicle of modern thought and expression in India.

Oriyā, in its grammar and pronunciation, is a very conservative language, and has preserved many of the features of the old Apabhramśa which is the source of all Oriyā the Magadhan speeches. It developed in the 17th century a remarkable power of absorbing Sanskrit words. Some of the poetical compositions in Oriyā, representing this tradition, are marvels of erudition in Sanskrit. From the second half of the 19th century Oriyā literature entered its modern phase and developed on similar lines with Bengali. The Oriyā script is derived from the Kuṭila script of Eastern India, but it has taken a new line of its own—the letters have rounded forms and the top flourish has a very important place, sometimes occupying nearly half of the letter.

(7) We have to describe next the languages of the Southwest and South—the Rājasthāni-Gujarātī group. The dialects of Rājasthānī-Gujarātī have now come within the orbit of Hindī. But the existence of a fairly extensive and important early Rājasthāni literature is making some Rājasthāni speakers, particularly among the Mārwāris, think of re-establishing their language as a separate speech, independent of Hindī. Rājasthāni is not a single language, but a group of dialects. It is a moot question whether the Mālavī dialects are to be regarded as being within the orbit of the common Rājasthāni

speech. Two important types of Rājasthānī are D̄hunḍhārī or Jaipur Rājasthānī, spoken in and around Jaipur; and Mārwārī. Their grammars are almost identical. But in D̄hunḍhārī they use *ko*, *kā*, *kī* for the genitive, and the root *ach* or *ch* for "to be", e.g., *Rājā-ko ghoro chai* = "the king has a horse"; in Mārwārī, however, the genitive suffix is *ro*, *rā*, *rī* and the root *ha* is used for the verb "to be"; e.g., *Rājā-ro ghoro hai* = "the king has a horse". Nowadays, D̄hunḍhārī is not much in use for literary purposes. It is Mārwārī which generally passes as Rājasthānī: and when we speak of "Rājasthānī literature", we usually mean Mārwārī literature, either in early Mārwārī (Diṅgal) or in modern Mārwārī. There is today a good deal of literary endeavour in Mārwārī. The standard form is the one spoken at Jodhpur. Texts are written and printed in Mārwārī —poems, short stories, novels, essays and translations. Gujarātī-Rājasthānī formed one language right up to about 1500 A.D. and then they parted company. The Rājasthānī dialects came more under the influence of the Braj-bhāṣā form of Western Hindī. In political and cultural matters, such great influence was exerted on Rājasthān from Delhi since the Mughal times that Rājasthānī came to be placed within the orbit of Hindustānī or Hindī, as if it were a Central or Midland language. This Midland or Old Hindī influence penetrated into Gujarātī as well, but not to the same extent. The dialects of Mālwā also come under Rājasthānī, and so do certain dialects spoken by the Bhils of Southern Rājasthān and Northern Gujarat. There is a dialect called *Gujarī* current among the pastoral peoples of Punjab and Kashmīr, and this also is a member of the Rājasthānī-Gujarātī group. It is a problem to find historical links between the *Gujarī* dialects of the North and Rājasthānī dialects.

We have also to mention *Saurāṣṭrī*, a dialect spoken by several thousands of silk and cotton weavers in the Telugu and Tamil countries. They took their speech from Saurāshtra several hundred years ago, and tentatively it can be placed within the Rājasthānī-Gujarātī group.

(8) South of Gujarātī we have the area of Marāṭhī, now spoken by more than 25 millions of people. It is a very rich language with a literature going back to the 12th century. The Mahārāshtra country became important in later medieval and modern times after the establishment of Sivāji's Hindu Marāṭhā empire, and Marāṭhī speakers have influenced to a great extent the political and cultural situation in North India as well as in the South.

(9) There are two speeches generally connected with Marāṭhī. One is Koṅkaṇī, the language of Goa and the coastal areas of

Mahārāshtra. Koṅkaṇī may be looked upon as an older offshoot of Proto-Marāṭhī, but it has some independent grammatical characteristics. It is split into a number of dialects. In Koṅkaṇī Goa, among the local Christians, the Roman Catholic missionaries have built up a literature which is of Christian inspiration. This is written and printed in the Roman character in a Portuguese Orthography.

The other is the Halbī dialect, current in the Bastar District in Madhya Pradesh. Although it has one or two grammatical forms resembling those of Marāṭhī, it is Halbī more allied to Eastern Hindī, Bhojpuri and Oriyā than to Marāṭhī. It has no literature worth mentioning.

(10) Finally, we have to consider the Himālayan speeches within the Indo-Aryan family. These are current along the Himālayan slopes, from East of Kashmīr up to Bhutān. The Himālayan speeches, known also as *Pahāṛī* and *Himālī*, are divided into three groups: (a) Western Himālayan, (b) Central Himālayan, and (c) Eastern Himālayan. Western Himālayan includes a number of small dialects which hardly have any literature. They are current from Chamba to Garhwāl and Kumaun. The speeches of Garhwāl and Kumaun belong to the Central Himālayan group. These also do not have much literature. The speakers of Western and Eastern Himālayan dialects have accepted Hindī as their literary language. It is different, however, with Eastern Himālayan. Nepālī, the official speech of Nepāl, is spreading fast among the local Tibeto-Burman speaking peoples. This language is also known as Khas-Kurā, Gorkhālī and Parbatiyā. Its literature goes back only to the 17th century. There are hundreds of thousands of Nepālis settled in India, and they are eager to have their language recognized as one of India's National Languages.

#### 6. *Dravidian Languages*

The Dravidian Languages form a family by themselves, and unlike the Aryan, the Austric, and the Sino-Tibetan speeches, they have no relations outside the Indian subcontinent (including Pākistān). Structurally, Dravidian agrees with many other language-groups outside India—the Ural-Altaic (Turkish, Mongol, Manchu, Finn, Esth, Lapp, Hungarian), and the North East Asian languages (like Japanese, Korean, Ainu, Kamchadal and Yukaghir).

The Dravidian languages belong to the class of speeches known as "agglutinative"; i.e., the word is made up of a root, which comes at the head or beginning, and the root is followed by one or more terminations, which were originally entire words but have taken up the function of modifying suffixes. There are no prefixes. A string of these affixes, attached to the root, gives the characteristic structure of Dravidian. This kind of "agglutination" in Dravidian does not go to the same extent as in other languages of this type outside India, e.g., Turkish and Hungarian or Finnish and Mongol. Thus, "I go" in Tamil is *pō-gir-ēn*; *pō* is the root, *gir* is the affix indicating present action, and *ēn* is a contracted form of the first personal pronoun, meaning "I". *Pō-gir-adu* means "it goes"; *adu* is the third personal pronoun neuter. It is surmised that Dravidian has largely influenced the Aryan speeches in India. The *pre-positions* of Old Indo-Aryan or Vedic Sanskrit are all lost to the modern Indo-Aryan languages. Instead, they have developed a whole series of *post-positions*, as in the Dravidian structure. In vocabulary and syntax also there has been a profound influence of Dravidian on Aryan. Dravidian itself on the other hand has been equally or even more profoundly influenced by Sanskrit and other Indo-Aryan languages; this applies especially to the four great literary languages : Telugu, Kannada, Tamil and Malayālam.

The Dravidian languages fall into several groups. The North-western group is now represented only by the Brahui speech current in Baluchistān. The Northern group includes a great literary language, Telugu, and a number of other speeches which have never been cultivated properly, such as the various Gondī dialects, Kurukh or Oraon, Maler or Mālpāhāriyā, Kui or Kandh, Parji, Kolami and a few others. The Southern Dravidian group of languages includes Kannada, Tamil and Malayālam. These, together with Telugu, form four of the most advanced languages of India, with rich literatures. Further, we have within the Southern group a number of speeches like Tulu, Kota, Toda, and Kodagu or the Coorg speech.

Telugu is numerically the most important of the Dravidian languages. It is current among 38 millions of people in the Union of India, and it has a very rich literature.

**Telugu**      Telugu has spread outside India also—in Burma, in Indo-China, in South Africa. A mellifluous language, it has been called by its admirers "the Italian of the East". Its vocabulary is very much influenced by Sanskrit. There is considerable literary activity in present-day Telugu. Until recently, there was a sharp differentiation between written Telugu and the spoken dialects, the former representing the archaic literary

language of medieval times, mainly in its grammar. The rift between the colloquial dialects and the literary language is now being bridged by a style which bases itself on the colloquial and at the same time seeks to preserve some of the literary forms.

Kannada, spoken by 17 millions, is another important language of India, the literary cultivation of which began from the middle of the 1st millennium A.D. In this language Kannada three stages may be noticed : (1) Old Kannada (Paññāda or Haññāda), current up to the middle of the 13th century; (2) Medieval Kannada (Naññāda), up to the 16th century; and (3) Hosa Kannada, which is substantially the language of the present day. One characteristic about Kannada is that the sound *p* of Old Dravidian, when it occurs singly, becomes an *h*. Kannada literature was enriched in the olden times by Jains and writers of the Vīraśaiva or Lingāyat sect, as also by Brahminical writers.

Tamil is current among 30 millions in India, besides 2 to 3 millions in Ceylon. In certain ways this language has preserved the Old Dravidian spirit best. Tamil literature goes back to the early centuries of the Christian era.

Tamil Some Tamil scholars think it goes back even to many centuries before Christ. In originality, though not in extent, Tamil literature stands by itself. Tamil presents certain new literary types which are not found in Sanskrit and other Aryan languages. The old heroic and romantic literature, didactic poems belonging to the oldest period of Tamil (*Sangam* literature), devotional hymns of the Śaiva and Vaiṣṇava saints, and a rich mass of narrative and didactic literature form the glory of Tamil. The language has preserved a good many old roots and words of Primitive Dravidian. While it includes an extensive Sanskrit element, Tamil has retained the purity of its Dravidian Vocabulary to a much greater extent than any other cultivated Dravidian language.

Malayālam had its origin in the Old Tamil of about 1,500 years ago. The Old Tamil speech, as current in Kerala, began to show simplifications and new characteristics as early as the 10th century. Then it followed its own path away from its sister dialects. The speech of Kerala developed independently and became transformed into Malayālam. The first Malayālam writings are said to go back to the 13th century, and in the 15th it was established as an independent literary language. Malayālam, more than any other language of India, Aryan or Dravidian, came under the spell of Sanskrit.

Tulu, until recently, was not at all cultivated. Its speakers took up Kannada as their literary language. Attempts are now

being made to develop its literature. Koṭa and Koḍagu as well as Toḍa have no literary or cultural importance. Toda is an archaic Tuḷu Dravidian speech, confined to less than a thousand people in the Nilgiri mountains, near Ootacamund.

Under the impact of the Aryan languages, in ancient and medieval times, Dravidian had to retreat almost everywhere. The influence of Sanskrit is still considerable. Nevertheless, Telugu, Kannada, Tamil and Malayālam have their honoured places in the hall of the great languages of India.

### *7. Austric Languages*

The Austric Languages have also been divided into several groups. First, we have the Mundā or Kol speeches as current in Eastern and Central India, and these have been taken to North Bengal and Assam by Muṇḍārī and Santālī speaking labourers in the tea plantations. Among the Mundā or Kol languages we have to note the Kherwārī group, which is current in Eastern India (Chota Nāgpur, Orissa, Madhya Pradesh, and Bengal) and includes Santālī (*Sāontālī*), Muṇḍārī, Ho, Birhor, Bhumij, Korwā and others; and there is Korku or Kurku, spoken in the west, in Berār.

Closely connected with this Mundā or Kol group, we have the Savara and Gadaba languages, besides Korku of Berār.

Then comes the Mon-Khmer branch of the Austric, spoken by one compact tribe in the north-east of India—the Khāsi-Jaintis of the Khāsi hills. The Austric languages, as stated before, are among the oldest in India, and the Austric peoples largely comprise the substratum of the Indian population throughout the country. Of these Austric languages, Santālī (spoken by nearly 3 millions), Muṇḍārī and Ho have a noteworthy literature preserved orally, consisting of songs and mythological and romantic stories. Collections of these, made by European missionaries and others, reveal the culture of the Austric people of India and their simple primitive life. The Austric languages had never been written down before the missionaries took up the task in the 19th century, and men like Skrefsrud, Bodding, Hoffmann, Campbell and W. G. Archer brought out volumes of stories and poetry which were current among the Santāls, Mundās, Hos and other Kol tribes. European missionaries first attempted to write down these Kol languages with the help of the Nāgarī and Bengali scripts, and some literature in these two scripts has been printed. The Santāl language, however, has been

largely written and printed in the Roman script. Several volumes of Santālī folk literature, edited by the Norwegian missionary P.O. Boddin, have been issued in attractive editions from Oslo, with English translations. J. Hoffmann's *Encyclopaedia Mundarica*, published by the Government of Bihār, is an important and authoritative work on the life, culture, religion and literature of the Mundās. The Mundā languages are not generally used for education, even in the primary stage. However, the Mundā-speaking peoples have begun to be interested in their language, and one Mundā-speaker has invented an alphabet for it. This alphabet has been cast in type and used in some primary school books, but it has not become popular, and so there will not be another addition to the Babel of Scripts which we already have in India. The University of Calcutta has given recognition to Santālī as one of the mother-tongues which may be offered at the School Final and Intermediate Examinations, and the University has reorganized all the three, Bengali, Roman and Nāgarī scripts for Santālī.

Among the important Austric languages, Khāsi is spoken by over 300,000 people. This language used to be written over a century ago in the Bengali-Assamese script. Through the influence of Welsh Methodist missionaries, the Roman alphabet has been adopted for Khāsi, and some literature has been produced. A society in Shillong for Khāsi culture has brought out small books on various aspects of the people's life in this language.

The Mundā and Mon-Khmer languages of the Austric family in India have not had much chance of unfettered development.

#### *8. Sino-Tibetan Languages*

Finally, there are the Sino-Tibetan languages which come under five important groups, of which only two are found in India; the others (Karen, Kachin or Lolo and Man or Miao-Tsze) are represented by speeches confined to Burma and China.

(a) *Thai-Chinese*:—These include the various "dialects" (so-called) of the Chinese (Han) language, and these are in fact distinct *languages*, not *dialects*, such as Cantonese, the Shanghai speech and Pekingese. All the *Modern Chinese Languages*, comparable to the Modern Indo-Aryan or Dravidian Languages, are derived from Ancient Chinese of c. 1000 B.C., which was then a single speech. Siamese (Thai) is

generally included in this group. There is, however, a strong body of opinion favouring the removal of Thai from the Sino-Tibetan family; Thai, it is said, is not a member of that family—its Sino-Tibetan element is really made up of loan-words from the Chinese. Two speeches which are forms of Thai belong to India: one, Ahom, the language of a dominant ruling people of Assam from 1228 A.D. has now become extinct. The other, Khamti, is spoken by a small tribe in the extreme north-eastern frontier of India.

(b) *Tibeto-Burman* :—These include *Bod* or Old Tibetan and the various modern colloquial forms of Tibetan, *Mran-ma* or Old Burmese, from which have come the modern Burmese dialects, including Arakanese; and the various Tibeto-Burman dialects of India spoken in Assam and North East Frontier Agency, in Nepāl and in other contiguous tracts below the Himālayas. The Tibeto-Burman dialects of India have to be divided into a number of subgroups, like Kuki-Chin, Nāgā-Bodo, Mikīr, Abor-Miri, Aka, Dafla and Singpho, and the various other Tibeto-Burman dialect groups of Nepāl and Himāchal Pradesh.

The Tibeto-Burman speeches of India are insignificant both culturally and numerically, but there are two exceptions—*Manipurī* (Meithei), and *Newārī*. Spoken or understood by nearly half a million people now, *Manipurī* is spreading among other Tibeto-Burman tribes in Manipur State and elsewhere. Its literature in the earlier phase is pure Meithei, without much Hindu influence; in the later phase, it is within the orbit of Sanskrit and of Bengal Vaiśṇavism. *Manipurī* was formerly written in an alphabet of its own, but of ultimate Indian origin. But when the people, Hinduized for several centuries, came under the influence of the Vaiśṇavism of Bengal, they adopted in the middle of the 18th century the Bengali script to write their language, and *Manipurī* is now written in Bengali script. There is a fairly large mass of printed literature in *Manipurī*, and the language is recognized by the Calcutta University up to the B.A. stage. The people of Manipur, orthodox Vaiśṇavas of the Caitanya school, are very proud of their language and culture.

*Newārī* is another Tibeto-Burman language, spoken in India by several thousands of emigrants from Nepāl. The name *Nepāl* is connected with the word *Newār* (or *Newāh*). As a matter of fact, *Nepāla* is the earlier form of the tribal name which is now current as *Newār*. The name *Nepāl* is now applied to the entire country, conquered by the Gorkhas from West Nepāl in 1767. This is thus an extension of the original name of the people of Eastern Nepāl, the Newārs, who are Tibeto-Burman in language and race but

Indian in religion and culture. It was the Newārs who built up the civilization of Nepāl. The Newār people, with their centres at Pātan, Kīrtipur, Bhātgaon and Kātmāndu, had adopted the eastern form of the North Indian alphabet, which is the same as that for Old Bengali, Old Maithilī and Old Assamese; and they produced quite a mass of literature in their mother-tongue Newārī as much as in Sanskrit. Newārī chronicles are characteristic productions—one of them goes back to about 1388 A.D. Today the Newārī language has once again come to its own in Nepāl. The Nāgarī script is now used to print Newārī.

Lepchā is another Tibeto-Burman language, spoken in Eastern Nepāl, Sikkim and Darjeeling. It has a script of its own, derived ultimately from the Tibetan, in which Christian missionaries have published a few books. The American authority on Sino-Tibetan Studies, Robert Shafer, has stated that Lepchā is really a branch of the Nāgā group of Tibeto-Burman; it is remarkable how this Nāgā language has found a home in Darjeeling, so far away from the Nāgā hills.

Dialects of Tibetan proper are also current in India, and Tibetan of course has a very rich literature. The dialects of Bhutān, Sikkim, Lāhul and Ladākh are forms of Tibetan.

### *9. Minor Languages*

Some other minor languages remain to be mentioned. The Andamans and the Nicobar Islands have two distinct groups of languages of which Andamanese is quite isolated. The people of the Andamans are Negroid in race. Their language, which has not been properly studied, is perhaps a survival of the original language of the Negroid peoples of India. It may be related to the speeches of other Negroid peoples in the East, like the Papuans of New Guinea, the Aetas of the Philippines and the Semang of Malaya. The total number of Andamanese-speakers does not exceed a thousand.

Nicobarese, on the other hand, is spoken by more than 10,000 people, and it is a branch of the Austric family of languages. As a form of the Mon-Khmer speech, it is closely related to Khāsi and some other languages of Burma, as also to Mon of South Burma and Khmer of Cambodia.

Among non-Indian languages, there are various speeches current among small groups of settlers or sojourners. We have a

good number of Chinese speakers in India, mostly in Calcutta and other big cities. They usually speak Cantonese and other forms of South Chinese. Some Tibetans and Burmese also live in India. In Western India, the Sidis, an African people, speak a form of the Somali language. There is a small group of Arabic speakers from Aden and from Irāq. Pashtu and Irānian (Persian) are also represented. Several European languages are, of course, spoken in India. English is the home language of Indian nationals numbering over 150,000. Portuguese is current in Goa. French is gradually receding in Pondicherry.

Some communities, long settled in India, have lost contact with their homeland and adopted Indian languages. The Pārsīs, for instance, speak Gujarātī. The Syrian Christians and the White Jews in Kerala speak Malayālam. The Beni-Israel Jews of the Marāthā country have given up their Arabic and adopted Marāthī.

In the story of languages in India, the importance of Sanskrit even today must be specially stressed. Sanskrit has been recognized as one of India's 14 National Languages, although Importance of it is not a spoken language anywhere. But it is Sanskrit interesting to note that there are still a few hundred people in India who regard Sanskrit as their home language. As a matter of fact, Sanskrit or rather the Old Indo-Aryan speech ceased to be a spoken language several centuries before Christ, and it changed into Middle Indo-Aryan or Prākrit and then into the Modern or New Indo-Aryan languages. But Sanskrit has always been cultivated all over India most assiduously, and it still forms a vital bond of union among most of the Indian languages. The unity of India is primarily the unity of culture, and Sanskrit is a symbol as well as an expression of this common pan-Indian culture. Besides, all the languages of India, including the Dravidian, take their words of higher culture from Sanskrit. The more Indian languages feel the need of new words for modern scientific and technological, as well as humanistic ideas, processes and concepts, the greater is the impact of Sanskrit on them. The words needed are taken straight from Sanskrit, or they are made up with the help of Sanskrit roots and terminations. On the decorative and ceremonial side of Indian life, Sanskrit still has its position of importance, as it is the language of Hindu religious ritual and worship. Sanskrit still remains the universally accepted and honoured vehicle of the civilization and the way of life that is specifically Indian. Sanskrit forms a great mental and spiritual link with the Indo-European world of the West, as it was and still is with the Buddhist and Brahmanical world of East Asia, Central Asia,

Indo-China and Indonesia. It has been rightly described as "the Symbol of our seniority among the Nations of the World".

After the Muslim advent in India, Arabic was in use among the Mullahs or Priests and Divines, and was sedulously cultivated

Arabic by a handful of scholars. But Arabic, particularly classical Arabic, is a difficult language compared with Persian.

The Persian language has a very simple grammar; besides, it has a kinship with the languages of North India. Since the time of Akbar the Great, Persian became the Language of Administration and of the Law Courts, in the Mughal Empire. Accounts began to be kept in Persian from 1571, when a changeover from Hindī took place in the Mughal finance offices. Persian words (both native Persian and Arabic, as well as a few from Turkish) were borrowed by the spoken languages of Delhi and contiguous areas, and they were also passed on to Marāthī, Telugu, Kannada and Tamil.

Persian In the 18th and early 19th centuries, the cultured classes, Muslim as well as Hindu, took to the study of Persian, and it became almost an Indian language. The mass of literature produced in it by Indian writers, from Punjab to Bengal, is not insignificant. Studies of India's contribution to Persian literature have appeared. Through Urdū, Persian still continues to be a living force in the Indian linguistic and literary field.

The English language came to India at the beginning of the 17th century. The conquest of Bengal by the British and their

English acquisition of the *Diwāni* or administrative rights from the Mughal Emperor Shāh ‘Ālam (1765) paved the way for the establishment of the

English language for administrative purposes. Persian continued to hold the field up to 1838, but intelligent Indians had already begun to realize the value of English. Men like the Mahārāshtrian official, Raghunath Hari Navalkar of Jhansi (round about 1770), and Raja Rammohun Roy (after 1800) strongly advocated the study of English and European Science and learning by Indians. Bengalis in Calcutta and Mahārāshtrians in Bombay thus took the lead. It was particularly in Bengal that the English language and its literature found a congenial home. It became the great vehicle through which modern ideas, not only in the physical sciences but also in literature and intellectual matters, and even in matters spiritual, flowed into India.

As British power spread all over the country, the English language became an instrument both for strengthening foreign rule and starting a strong nationalistic movement against it. It has played the great role of a modernizer and an emancipator. The

close contact with English made Indian literature immensely fruitful. It was indeed the English language and literature that helped to modernize the Indian mind, build up the concept of Indian Nationalism, and inspire democratic ideals.

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## CHAPTER VIII

### RELIGION

#### 1. *Hinduism*

IT HAS BEEN POINTED out by Dr. Arnold J. Toynbee, in *A Study of History*, that the principal civilizations of the world lay different degrees of emphasis on specific lines of activity. Hellenic civilization, for instance, displays a manifest tendency towards a prominently aesthetic outlook on life as a whole. Indic civilization, on the other hand, shows an equally manifest tendency towards a predominantly religious outlook. Dr. Toynbee's remark sums up what has been observed by many other scholars. Indeed, the study of Hinduism has to be, in a large measure, a study of the general Hindu outlook on life.

Receptivity and all-comprehensiveness, it has been aptly stated, are the main characteristics of Hinduism. Since it has had no difficulty in bringing diverse faiths within its ever-widening fold, it has something to offer to almost all minds. Monier-Williams in his notable work *Brahmanism and Hinduism* dwelt on this aspect about a hundred years ago. The strength of Hinduism, he emphasized, lies in its infinite adaptability to the infinite diversity of human character and human tendencies. It has its highly spiritual and abstract side suited to the philosopher; its practical and concrete side congenial to the man of the world; its aesthetic and ceremonial side attuned to the man of the poetic feeling and imagination; and its quiescent, contemplative aspect that has its appeal for the man of peace and the lover of seclusion. The Hindus, according to him, were Spinozists more than 2,000 years before the advent of Spinoza, Darwinians many centuries before Darwin, and Evolutionists many centuries before the doctrine of Evolution was accepted by scientists of the present age.

No civilization anywhere in the world, with the probable exception of China, has been as continuous as that of India. While the civilizations of Egypt, Babylonia and Assyria have disappeared, in India the ideas emanating from the Vedic times continue to be a living force.

European scholars of Sanskrit like Sir William Jones noted similarities in language, terminology and substance of Indian scriptures with those of Greece and Rome. Even a superficial study

convinced them that, while the language of the Vedas is a great critical instrument in the construction of the science of philology, the Vedic hymns constitute a compilation of most Indo-European myths in their primitive form. Max Müller went so far as to say that the Vedas are the real theogony of the Aryan races, Homer and Hesiod having given a distorted picture of the original image.

The excavations at Harappa and Mohenjodaro and those in Saurāshtra have disclosed the existence of a highly evolved culture long before the Aryan immigration, perhaps dating back to 3000 B. C. or earlier. Among the remains discovered are a three-faced prototype of Śiva seated in a yogic posture, representations of the Liṅga, and a horned goddess associated with the peepul tree. These symbols, evolved by a very ancient civilization, were assimilated by the Aryan immigrants in slow stages—their earliest literary work, the *Rg-Veda*, almost overlooks this aspect. The Vedic Aryans, it has been suggested, partly assimilated and partly destroyed the earlier culture.

It seems clear from the hymns of the *Rg-Veda* and the Persian *Gāthās* and Avesta that the Vedic Aryans and the Zoroastrians had a common origin. The languages in which Zoroaster preached and the *Rṣis* sang their hymns are almost identical, and Vedic metres are reproduced in the Avesta. Evidently, the two groups of Aryans separated after a violent quarrel, so that several deities of one group—Indra or Jindra, Sarva and Nāsatya—were transformed in the other into evil spirits. It is, however, to be noticed that Mitra, Aryama, Vāyu and Vṛtraghna are divine in both the systems. A period of unity was probably followed by civil war, as envisaged in the fight between *Asuras* and *Devas*.

The Vedic Aryans were warlike, while the Avesta reflects an abhorrence of war. In the period when the ancestors of the Irānians and the Hindus had lived together, *Asura* had been a term of honour; and the Zoroastrian Ahura Mazdā was Asura Mahat, the great Asura. The *Rg-Veda* (III-55-11 & 15) cites several *Asura* qualities of the Divinities. Varuna, Mitra and several other gods were called *Asuras*. Later, when differences were accentuated between the two communities, *Asura* became equivalent to a spirit of evil and *Sura* came to signify a good spirit.

The undivided Indo-Irānians must have passed a long time in their Central Asian home. The Indo-Irānian culture and religion have been reconstructed, at least in part, by comparing the Vedas with the Avesta. Before the occupation of Irānian highlands by tribes from the Indo-Irānian original home, the plateau was the seat of a culture that was probably matriarchal, and the

people worshipped snake-gods in the manner of India's primitive non-Aryans. It is likely that the pre-Aryan cultures of North-western India and Irān were alike in origin and spirit.

This ancient cultural link between pre-Aryan Irān and pre-Aryan India, instead of getting strengthened by Aryan migration into the two countries, as could be normally expected, was to all appearances completely severed. Also, there is nothing to show that the Vedic Aryans of India maintained an active cultural relation with their brethren in Irān.

In the earliest days, while the Aryans of India must have been connected with the Aryans of Irān as friends or as foes, actual historical contact cannot be asserted with any degree of probability. The two peoples turned their backs upon each other, as it were, and developed their distinctive civilizations apparently without the least mutual influence, although in language, culture and religion their similarity in the earliest period had been little short of identity. When, later in history, under the Achaemenids, Greeks, Bactrians and Śakas, the Irānians and the Indians were forced to meet as citizens of the same empire, they met as complete strangers, not as cousins or as scions from the same stock.

The earliest literary productions of the Aryan settlers in India were the *Rg-Veda*, *Sāma Veda* (consisting of chants), *Yajur Veda* and the *Atharva Veda* (a composite religious and magical compilation). The Vedas comprise Mantras (hymns), Brāhmaṇas (ritual and ceremonies), Āraṇyakas (forest speculations) and the philosophical Upaniṣads. In the context of this commonly accepted interpretation of the Vedas, it may be recalled that European Orientalists have too often considered them mainly from the theological, anthropological and sociological points of view. A study of the material in its religious aspect is difficult, since even the great commentary of Sāyaṇa is in terms of the ideas of his own age. On the presumption that the Vedas originated in primitive times, the *Rg-Veda* hymns were regarded as the outpourings of a child-like nature workshop. John Dowson in his *Hindu Classical Dictionary* observed:

"The Aryan settlers were a pastoral and agricultural people, and they were keenly alive to those influences which affected their prosperity and comfort. They knew the effects of heat and cold, rain and drought, upon their crops and herds, and they marked the influence of warmth and cold, sunshine and rain, wind and storm, upon their own personal comfort. They invested these benign and evil influences with a personality; and behind the fire, the sun, the cloud, and the other powers of nature, they saw beings who directed them in their

beneficent and evil operations. To these imaginary beings they addressed their praises, and to them they put up their prayers for temporal blessings. They observed also the movements of the sun and moon, the constant succession of day and night, the intervening periods of morn and eve, and to these also they gave personalities, which they invested with poetical clothing and attributes. Thus observant of nature in its various changes and operations, alive to its influences upon themselves, and perceptive of its beauties, they formed for themselves deities in whose glory and honour they exerted their poetic faculty."

But on a careful analysis of the Vedas it would be apparent that the Vedic view is more subtle and deeper in concept. The One Being whom the sages call by many names (*Ekam-sat*) is referred to in the neuter gender, signifying divine existence and not a divine individual. The monotheistic God stands in relation to man as a father and a patriarch, while in a *Rg-Veda* hymn to Agni he is called "my father, my kinsman, my brother and my friend". Monotheism, it has been aptly stated, contemplates the Divine in heaven and polytheism contemplates the Divine in the universe. Polytheism believes in the assembly of gods, each possessing a character of his own. Max Müller coined the word *henotheism* for indicating the tendency of the Vedic seers to magnify the importance of the particular deity they are praising in a hymn at the expense of the other gods. This has been described as "opportunist monotheism". One deity is identified with another or different deities are identified with one divine entity, indifferently described as *Ekam* (one) and *Tat Sat* (the reality).

Apart from these concepts, there are two basic ideas underlying the Vedas—*Satya* (truth) and *Rta* (eternal order); and every god or goddess exemplifies and represents these two ideas.

**Vedic concepts** As Abinash Chandra Bose says in his *Call of the Vedas*, Vedic theism is based on moral values which (as also in the case of Buddhism) may be upheld in a non-theistic way. In India it is not the atheist who is denounced but the person who repudiates *Dharma*, moral law. The *Rg-Veda* (X-85-1) states that the earth is sustained not by the will of God but by truth, and of this truth God is the supreme exponent, revealing Himself through *Rta* or eternal order. Examining the Vedic hymns as a whole, one discovers a doctrine, not of oneness, but of one divine substance pervading all. It is stated that the One Being is contemplated by the sages in many forms: *Ekam santam bahudhā kalpayanti* (*Rg-Veda*, X-114-5). It may also be observed that the

Vedic ritual or *Yajña* is a uniform ceremonial; whatever deity is worshipped, the ritual is the same.

The universality of the Vedas is not often realized. The *Rg-Veda* asserts that God is the God of Dāsa as well as of Ārya—"Lord God is he to whom both Ārya and Dāsa belong." (*Rg-Veda*, VIII-51-9). There is a special prayer for the forgiveness of sins against the foreigner (*Rg-Veda*, V-35-7). According to the *Atharva Veda*, God is of the foreigner (*Videśya*) no less than of our own land (*Samdeśya*). There are *mantras* which extend this principle to all living beings (*sarvāni bhūtāni*) (*Yajur Veda*, 36-18), so that we come to a grand conception of universal peace and serenity—the harmony with Nature (*sarvam śāntih*) (*Yajur Veda*, 36-17).

Pāṇini is one of the world's earliest as well as the greatest of scientific grammarians. The consensus of opinion fixed his date

not later than the 5th century B. C. At that period

Many schools of thought *Yajña* or sacrifice and the worship of various deities were current and popular; and theistic devotion to

particular divinities, generally expressed by the term *Bhakti*, had become prevalent. Pāṇini refers to Vāsudeva as the object of devotion, and *Paramātmā Devatā Viśeṣa*, a form of the One Supreme Divinity. The doctrine which assumed great importance later—that custom has the force of law—is also exemplified by the twofold meaning, in Pāṇini's *Aṣṭādhyāyī*, attached to *Dharma*. *Dharma* is not only equivalent to *Rta*, primordial law, but also denotes custom (*ācāra*) as in the later *Dharma Sūtras*. Already in Pāṇini's days different schools of thought had arisen, both theistic and non-theistic. A non-theistic doctrine, which is described in Buddhist philosophy as the doctrine of non-causation and also as the doctrine of *Yadṛcchā* (fortuitous accident), was current in Pāṇini's time. That all existence was the result of chance was the doctrine of the Ahetuvādins. The *Śvetāśvatara Upaniṣad* which advocates the doctrine of the supreme spirit refers to other varieties of thought like those of the advocates of *Svabhāva* or materialistic philosophy. Orthodox thought, was later developed in the *Sāṃkhya* philosophy and attained its climax in the *Vedānta Sūtras*. Pāṇini refers to *Parāśara Sūtra*, one of the earliest of the *Vedānta* treatises, and also to the atheistic school, known later as the *Lokāyata*. There is mention also of *Niḥśreyasa* which, in the *Upaniṣads*, denoted supreme bliss as also of *Nirvāṇa*, possibly associated with Buddhism. From all these examples it is clear that, in the times of the Buddha and Pāṇini, practically all the varieties of speculation which have flourished in India had already been evolved.

Philosophical discourses and pursuits were at first specially

developed by the Kṣatriyas, but they soon became the prerogatives of the Brahmins. The *Chāndogya* and *Kausītaki Upaniṣads* illustrate these successive stages. A solution of the ultimate problems of life is outlined in the early *Upaniṣads*, and it takes the form of Monism, absolute (according to Śaṅkarācārya) or modified (according to Rāmānuja). Filled with zeal for this doctrine of the Unity or Interdependence of all life, a social order was founded. Dr. Ananda Coomaraswamy in his *Dance of Śiva* says that the great Epics represented the desired social order as having actually existed in the golden past; they put into the mouths of their heroes not only the philosophy but the theory of its application in practice; this is evident, above all, in the long discourse of the dying Bhīṣma in the Sāntiparva of the *Mahābhārata*. "The heroes themselves they made ideal types of character for the guidance of all subsequent generations; for the education of India has been accomplished deliberately through hero-worship. In the Dharmashastra of Manu and the Arthashastra of Chanakya—perhaps the most remarkable sociological documents the world possesses—they set forth the picture of the ideal society, defined from the standpoint of law. By these and other means they accomplished what has not yet been effected in any other country, in making religious philosophy the essential and intelligible basis of popular culture and national polity".

What, then, is this view of life? The inseparable unity of the material and spiritual world is made the foundation of Indian culture and that determines the whole character of Indian social ideals.

Later Hindu thought is founded on the rhythmic nature of the world process, including evolution and involution, birth, death and rebirth, *sṛṣti* and *samhāra*. Every individual life—mineral, vegetable, animal, human—has a beginning and an end; this creation and destruction, appearance and disappearance, are of the essence of the world process and equally originate in the past, present and future. According to this view, then, every individual ego (*jīvātman*) or separate expression of the general will to life (*icchā*, *trṣṇā*), must be regarded as having reached a certain stage of its own cycle. This is also true of the collective life of a nation, a planet or a cosmic system. It is further considered that the turning-point of this curve is reached in man, and hence the immeasurable value which Hindus (and Buddhists) attach to birth in human form. Before the turning-point is reached—to use the language of Christian theology—the natural man prevails; after it, the regenerate man.

To sum up, Indian philosophic thought developed in several stages. The Vedic period is generally placed between 2500 B. C. and 600 B. C. As already indicated, the four Vedas, The Upaniṣads the Brāhmaṇas, Āranyakas, and Upanisads are creations of the early stages. The Upaniṣads are diverse in character and outlook. They recognize intuition rather than reason as a path to ultimate truth. They also represent a strong reaction against the merely ritual and sacrificial duties on which stress had been laid earlier. The Upaniṣads are supposed to be 108 or more in number. Twelve of them are generally recognized as the principal units. The 'Iśa Upaniṣad' begins with the statement that whatever exists in this world is enveloped by the Supreme. It is by renunciation and absence of possessiveness that the soul is saved. In the *Kena Upaniṣad*, the Goddess Umā Haimavatī in the form of Supreme Knowledge expounds the doctrine of the *Brahman* or Supreme Entity. The *Kaṭha Upaniṣad* embodies the aspiration of Naciketas, who declined his father's offer of property and went into exile, making his way to the region of Yama, the God of Death. Naciketas, in his dialogue with Yama, declines all worldly possessions and dignities offered by Yama and asserts that all enjoyments are transient and the boon he asks for is the secret of immortality. In this Upaniṣad occurs the famous saying : "The knowledge of the Supreme is not gained by argument but by the teaching of one who possesses intuition." In the *Mundaka Upaniṣad* occurs the verse which is the germ of the *Bhagavad-Gītā*. People who perform actions and are attached to the world are pursuing a futile path, and this Upaniṣad accordingly declares : "Let the wise man, having examined the world and perceived the motives and the results of actions, realize that as from a blazing fire sparks proceed, living souls originate from the indestructible *Brahman* and return to Him. All doubts disappear and the attachment to work subsides when the Supreme Being is cognized."

These basic doctrines are further expounded in the *Taittirīya Upanisad*, which contains this famous verse repeated in other Upaniṣads : "May we both (teacher and disciple) be protected; may we both obtain sustenance; let both of us at the same time apply (our) energies (for the acquirement of knowledge); may our reading be illustrious; may there be no hatred (amongst us). Peace, peace, peace."

In the more recent *Svetāśvatara Upaniṣad* is found a summary of the main Upaniṣadic doctrines, and the idea of devotion to a personal God is also developed. The *Chāndogya Upaniṣad*, one of the earliest, states that the main doctrines of the Upaniṣads, were first expounded by the Kṣatriyas and not by the Brahmins.

Later, as is evident from the *Kauśitaki Upaniṣad*, the Brahmins took up the intensive study of philosophy. The contrast which is often drawn between Brahminism and Hinduism is therefore not based on a right appraisal of the facts.

The period of the Epics succeeded the period of the Upaniṣads. In the *Rāmāyaṇa* and the *Mahābhārata*, philosophical doctrines were presented in the form of stories and parables.

**The Epics**      In these poems of the heroic age recounting the qualities and exploits of exalted individuals the Vedic gods are no longer supreme. Some have disappeared altogether. Indra retains a place of some dignity; but Brahmā, Śiva and Viṣṇu have risen to pre-eminence. Even of these three, the first becomes subordinate. Viṣṇu and Śiva become the outstanding entities and are alternately elevated to supreme dignity and very often their ultimate oneness is proclaimed. Viṣṇu in the Vedas was the friend and companion of Indra and strode over the universe in three paces; in the Epics he often becomes the great deity of destruction as well as of renovation. Each of these two gods in his turn contends with and subdues the other; now one, now the other, receives the homage of his rival, and each in turn is lauded and honoured as the greatest of gods.

The *Avatāras*, incarnations of Viṣṇu, assume a prominent place in the Epics, and more so in the Purāṇas. The first three, Matsya (fish), Kūrma (tortoise) and Varāha (boar) have a cosmic character and are foreshadowed in the hymns of the Vedas. The fourth incarnation, Nṛsiṁha (man-lion), seems to belong to a later age, when the worship of Viṣṇu had become established. The fifth, Vāmana (dwarf), whose three strides deprived the *Asuras* of the domination of heaven and earth, is in character anterior to the fourth *Avatāra* and the three strides are attributed to Viṣṇu in the Vedic text Urukrama. The sixth, seventh and eighth, Paraśurāma, Rāmcandra and Kṛṣṇa, are mortal heroes whose exploits are celebrated in these poems so fervently as to raise the heroes to the rank of gods. The ninth *Avatāra*, the Buddha, is the deification of a great teacher. The tenth, Kalki, is yet to come; he resembles the manifestation referred to in the Biblical Revelation. The system of religious thought propounded in the Vedas and the Epics and especially in the *Bhagavad-Gītā* (a part of the *Mahābhārata*) survived the Buddhist impact which led to a renunciation of much ritual and metaphysics on the part of a sizable proportion of the population. Buddhism was absorbed into the parent religion within a few centuries and Hinduism, as the Vedic religion had come to be called, adopted the theory of the *Avatāras* or incarnations according to which the Buddha himself was accepted as

an *Avatāra*. Jainism also became, in essence, a doctrinal modification and adaptation of the Vedic religion.

As Dr. Töynbee has noted, in response to an ever more insistent craving in Indic souls to apprehend the unity of God, the myriad divinities gradually dissolved and coalesced into one or the other of the two mighty figures of Śiva and Viṣṇu. He adds that this stage on the road towards the apprehension of the unity of God was attained by Hinduism at least 1,500 years ago.

We now come to the great contribution made by the Buddha to Indian thought and world culture. Dr. Radhakrishnan, in his edition of *Dhammapada* (which embodies Buddhist teachings), has stated that, judged by intellectual integrity, moral earnestness and spiritual insight, the Buddha is undoubtedly one of the greatest figures in history. The same scholar has pointed out that, although there were different streams of thought operating on men's minds in the 6th century B. C. philosophic thought was agreed at that time on certain fundamentals. Life does not begin at birth or end at death; it is a link in an infinite series of lives, each of which is conditioned and determined by acts done in previous existences. Relief from the round of births, resulting in life in eternity is the goal, indicated by such terms as *Mokṣa* (deliverance) and *Nirvāṇa* (union with the *Brahman*). The means of attainment are prayer and worship; ritual and sacrifice; Yoga and asceticism; and *Vidyā* (realization by knowledge). Even though the Buddha accepted the doctrines of Karma and rebirth and the non-reality of the empirical universe, he declined to speculate on *Mokṣa* and on the doctrine of the *Ātman* and *Paramātman*. He laid stress on the supremacy of the ethical aspect, and his outlook was definitely practical and empirical. In fact, the Buddha did not tolerate any doctrines which, he thought, diverted the mind from the central problem of suffering, the cause of suffering and its removal, and the urgency of the moral task. He rejected the doctrine of the Vedānta that the ego is permanent and unchanging. At the same time, he did not countenance the view that, at death, it is destroyed. As Dr. Radhakrishnan says, the Buddha came to the conclusion that interest in the supernatural diverts attention and energy from the ethical values and the exploration of actual conditions: Karma builds the world and *Dharma* is an organic part of all existence.

Every variety of Hindu philosophy has its source in the Upaniṣads, the *Brahma Sūtras* of Bādarāyaṇa or Vyāsa and the *Bhagavad-Gītā* which forms a part of the *Mahābhārata*. It was as a reaction to the tendencies exhibited by Buddhism and Jainism that the orthodox schools of Indian philosophy had their origin,

and the *Bhagavad-Gītā* is their epitome. This work contains the essence of Indian teaching about the duties of life as well as spiritual obligations. Everyone has his allotted The Bhagavad-  
Gītā duties of various kinds. Sin arises not from the nature of the work itself but from the disposition with which the work is performed. When it is performed without attachment to the result, it cannot tarnish the soul and impede its quest. True Yoga consists in the acquisition of experience and the passage through life in harmony with the ultimate laws of equanimity, non-attachment to the fruits of action, and faith in the pervasiveness of the Supreme Spirit. Absorption in that Spirit can be attained along several paths; and no path is to be preferred exclusively and none to be disdained. These doctrines have been interpreted as marking a Protestant movement which lays stress on the personality of God and His accessibility to devotion. While following the Hindu ideal of the *Āśramas*, the *Gītā* emphasizes the importance of knowledge, charity, penance and worship, and does not decry life as evil:

“Nor indeed can embodied beings completely relinquish action; verily, he who relinquisheth the fruit of action, he is said to be a true relinquisher.”

Later, treatises on ethical and social philosophy known as the Dharma Sāstras were compiled. They deal systematically with the proper conduct of life and describe social, ethical and religious obligations. The Sūtras, of which the *Brahma Sūtra* is the chief, are brief aphorisms or maxims. They contain interpretations of philosophic systems and refutations of opposing beliefs. It is remarkable that all philosophical systems in India are known as *Darśanas*, literally meaning insights or points of view. In the well known *Sarvadarśanasaṅgraha* compiled by Mādhavācārya, a great successor of Śaṅkarācārya, the Cārvāka or atheistic school, Buddhism, Jainism, the Vaiṣṇava philosophy of Rāmānuja and Madhva, the Śaiva system and several other doctrinal variants, are all described as *Darśanas* and as legitimate developments of Hindu thought. There are Sūtras dealing with the Logical Realism of Nyāya, the Atomistic Pluralism of Vaiśeṣika, the Evolutionism of Sāṃkhya, the technique of Mind-control or Yoga, the ritualistic philosophy of Pūrva-Mīmāṃsā and the metaphysics of Vedānta which attained its climax in the work of Śaṅkara.

The Aryans marched *en masse*, guided by a leader who was often a poet, and came into contact with the Dāsas and the Dasyus. The point to be noted is the speedy fusion of the Aryans with the non-Aryans. The process had three phases : (1) The elevation

of non-Aryans and aborigines by intermarriages with Aryans. (2) The incorporation of non-Aryans into Aryan society in various other ways. (3) Social reactions by which forms of life and modes of thought of the two groups underwent a kind of osmosis, intensified by the Buddhist protestant reformation.

*The Aitareya Brāhmaṇa* gives an example of the manner in which progressive leaders of the Aryans facilitated the assimilation of other communities. A *Rṣi* was performing a sacrifice on the banks of the Sarasvatī; and to this sacrifice was admitted one Keśava Ailūṣa, a Śūdra, whose learning is stated to have put all the Brahmins to shame. The *Vājasaneyi Saṁhitā* condemned inter-communal marriage, but it is narrated in that work (ch. 23, 30 and 31) that a Śūdra was the lover of an Ārya woman. By the time of the *Mahābhārata*, such great personages as Vyāsa and Vidura were described as the offspring of the connection of the Aryans with other groups. The story of Śantanu and Satyavatī, the vow of Bhīṣma as well as the story of Ambikā and Ambālikā and the birth of Vidura, also illustrate the above process. Again, in the *Mahābhārata*, it is narrated that Bhīma married Hidimbā, a non-Aryan woman, and Arjuna married a Nāga girl, Ulūpī. A new class of Aryans called Utkṛṣṭa came into existence, and was admitted to the privileges of sacrifice. By the time of the *Śatapatha Brāhmaṇa*, Śūdras became incorporated in the polity—a notable instance being the Niṣādas. It is a curious fact (*vide* Pāṇini's Grammar, ch. VI, 62, 58) that there were non-Aryan Brahmins as well.

Parāśara, one of the great sages of India, married Satyavatī, a fisher girl, who became the mother of Vyāsa, the compiler of the *Mahābhārata* and the Purāṇas. Such intermarriages or unions were frequent all through Indian history. Emperor Candragupta Maurya who belonged to a lower caste, married Kumāra Devī of the Licchavi clan, who was either a Brahmin or a Kṣatriya, and she was the grandmother of Aśoka.

It should be remembered that the groups which crystallized later into the Indian castes were initially not based on any gradation of superiority, the difference being functional rather than racial or communal. These groups, moreover, had their analogues in the Avesta, and the Irānian names do not suggest the idea of colour or superiority. Co-operation of all the classes was needed for administration, and a passage in the *Mahābhārata* indicates that the King's Council included representatives of all classes of the people.

The current rigidity of the rules relating to intermarriage as

also interdining among the Indian castes is a comparatively recent innovation. These lines found in several Purāṇas are significant: "The great sage Vasiṣṭha was born of a divine courtesan, but by austerity and penance he made himself recognized as a Brahmin. The transforming process was attained by self-improvement." Another passage says: "Vyāsa was by birth a fisherman. Parāśara was born among a dog-eating tribe. Many non-*Dvijas* have in the past attained Brahminhood by their merit." The *Bhagavad-Gītā* affirms: "Castes developed according to the differentiation of *Guna* and Karma, i.e., disposition or temperament and inherited instincts or aptitudes."

Both among the Old Irānians and the Aryans of India the original caste system of three classes based on the practical distribution of functions was in existence. The Irānians, however, did not develop another class as the Hindus did—the Śūdra. Clearly, the three Hindu caste divisions were not unalterably rigid. The definition of the word *Dvija*, twice-born, makes the position clear. *Dvija* is a person who has certain basic qualities: "If a man's activities be derived from his *jāti* or birth, from his occupation, from study and knowledge, and if all these are found combined, then he is to be called a *Dvija*, and not otherwise."

In their great trek to India the colonizing groups of Aryans encountered races who professed a firm belief in the doctrine of transmigration. It has indeed been suggested that Cultural synthesis this doctrine of metempsychosis itself, the cult of serpent worship, the worship of Ganeśa, of Umā or Durgā, of Skanda or Subrahmaṇya (the hunter-god) were all adopted by the Aryans from earlier settlers in India. Even the incarnation of Kṛṣṇa, it has been said, was an adaptation from an aboriginal deity; his life is an instance of the mingling of the Aryans and the Yādavas. In any case, it seems clear that there was a good measure of synthesis of the thoughts and beliefs of the Aryan and pre-Aryan races.

There are widespread traditions of the southern migration of the Vedic sage, Agastya, the reputed author of several hymns of the *Rg-Veda*. His āśrama was located south of the Vindhya; and he is said to have introduced the Vedic religion and literature in the South, as a unifying factor between the Sanskritic and Dravidian tongues and ideals. When the Aryan colonisers in the wake of Agastya penetrated to the South, they found an advanced civilization. The *Rāmāyaṇa* describes Madurai as adorned with golden jewels. The grammarian Kātyāyana mentions the Pāṇḍyas and the Colas. Aśoka's Buddhist missions were sent to the Pāṇḍya and Cola countries as far as the Tāmraparni river in the

Tirunelveli District. An extensive commercial and cultural intercourse grew up between the Aryans and the Dravidians, as also between the Dravidians and countries to the east and west of India.

The close contact between the Aryan and Dravidian elements continued all through history and manifested itself in every aspect of life. There is strong ground for the supposition that the importance of Śiva, Śakti and Skanda was due largely to Dravidian influence, since the cult of Āñ (Śiva), Ammā (Śakti) and Añil (Muruga or Skanda) was a cardinal belief from the beginning of Dravidian history.

These facts illustrate the composite character of Hindu civilization. The *Sāma Veda* spoke at length of the *Vrātyastoma* (a particular sacrifice or ritual) by which non-Aryans (*Vrātyas*) were admitted into Aryan society. The equalization of castes and communities was, of course, brought to a head by Gautama Buddha, though he was no opponent of the Brahminical civilization. Both he and Mahāvīra, the expounder of Jainism, while admitting that the Brahmin ideal is the right one, led a crusade against certain aspects of Brahmin culture. Hindu civilization itself adapted for its use many ideals and precepts of Buddhism and Jainism. For instance, among many communities, offerings of rice and ghee took the place of animal sacrifice—a compromise with the Vedic ritualism. The early Aryans had, of course, been meat-eaters, but probably under the influence of Buddhist and Jain ideas many groups of Brahmins as well as non-Brahmins became vegetarian.

The Purāṇas cover the intermediate period between the Vedic and the Classical epochs. Cast in the form of parables and narratives, they became the scripture for the common people. Apart from their religious and often sectarian significance, they furnish a picture of social, political and cultural life and comprise an astonishingly varied repertory of folklore and information regarding diverse topics including philosophy, ethics, legal institutions, popular festivals, and several arts; they deal even with subjects like grammar, prosody, rhetoric, archery and care of horses and elephants; many of them also describe places of pilgrimage. At one time their historical value was discounted; but it is now being gradually appreciated.

The next important milestone is the advent of Śaṅkara. In his short but marvellously active life, he travelled all through the country, refuting atheistic and materialistic systems of thought, and wrote commentaries on the *Upaniṣads*, on the *Brahma Sūtra* and on the *Gītā*. He interpreted these scriptures and built up his thesis with wonderful clarity and depth of exposition. He remoulded Indian thought and destroyed

The advent  
of Śaṅkara

many dogmas. His great capacity for deep feeling and emotional expression was combined with relentless logic. Śaṅkara's contribution to philosophy is his blending of the doctrines of Karma and Māyā, which culminated in a logical exposition of the idea of non-dualism. The entire universe consisting of *Nāmarūpa*, names and forms, is but an appearance; *Brahman*, infinite consciousness, is the sole reality. Its attainment and the annihilation of the great illusion of the universe called Māyā, by a process of realization, were the objects of Śaṅkara's quest. He revivified the doctrines of the Upaniṣads and, in Dr. Radhakrishnan's words, he was not a mere dreaming idealist but a practical visionary. His Advaita doctrine is still a living force in India. Śaṅkarācārya established several *mathas* in India to propagate the Vedāntic or Advaita doctrine and the successive heads of these *mathas* as well as later scholars like Madhusūdana Sarasvatī and the great polymath Appayya Dīkṣita have produced important treatises, elucidating the Vedānta as propounded by Śaṅkarācārya.

Śaṅkara was followed by Rāmānuja, Madhvā and others who called themselves commentators but were indeed creators of new systems. Rāmānuja's philosophy was termed qualified monism and Madhvā's was a dualistic system. The three major forms of Vedānta developed respectively by Śaṅkara, Rāmānuja, and Madhvā are distinct philosophies, although each professes to have stemmed from the same three sources—the Upaniṣads, the *Brahma Sūtra* and the *Gītā*.

The spirit of Indian philosophy has been described in these words: "Its chief mark consists in concentration on the spiritual aspect, belief in the intimate relationship of philosophy and life, the inseparability of theory and practice, and the insistence on intuition co-existing with the acceptance of authority." Finally, it is the synthetic vision of Indian philosophy which has made possible the intellectual and religious tolerance so pronounced in Indian thought throughout the ages. Recent squabbles between religious communities, born of political factionalism, are alien to the basic Indian mind and are indeed antagonistic to its unique genius for adaptability and tolerance.

At a later period arose the Bhakti movement leading to Vaiṣṇavism and Saivism. The ancient Vaiṣṇava mystics and saints in the South were known as Ālvārs, and the Vaisnavism in the South teachers as Ācāryas. They had a powerful exponent of their views in Rāmānuja, who attacked the Advaita interpretation of the Upaniṣads and gave recognition to three ultimate realities, God, Soul and Matter, the last two being dependent on the first.

As early as the 2nd century B. C. the renowned Besnagar Column had been erected by a Greek named Heliodorus, who had been converted to the Bhāgavata or Vaiṣṇava faith of which the Pāñcarātra doctrines then formed an integral part; its scriptures were *Sātvata Saṁhitā*, the *Mahābhārata*, and the *Bhāgavata* and *Viṣṇu Purāṇas*. The origin of the Pāñcarātra doctrines which form the basis of Śrīvaiṣṇava culture has been traced further back to the well known *Puruṣasūkta* of the *Rg-Veda*. The *Śatapatha Brāhmaṇa* refers to the Pāñcarātra sacrifices performed by the primeval Nārāyaṇa, the idea of Nara and Nārāyaṇa (Primordial man and the deity Viṣṇu) being an integral part of ancient Indian thought. There are more than a dozen Vaiṣṇava Upaniṣads. It was in the period from the 10th century up to the 17th that many Vaiṣṇava works were produced. The Vaiṣṇavas regard the Pāñcarātra literature as almost equal to the Vedas.

The Vaiṣṇava Saṁhitās and other works insist on knowledge of and devotion to, the supreme Godhead rather than on Vedic studies or sacrifices. It is worthy of note that in the *Bhāgavata Purāṇa* (11th *Skanda*) the Ālvārs were prefigured; several great devotees of Viṣṇu, the Purāṇa states, would appear on the banks of the Tāmraparni, Kṛtamala (Vaigai), Payasvinī (Pälär), Kāverī (Cauvery) and Mahānadi (Periyār).

The Ālvārs lived between the 5th and 12th centuries. The first group included Saroyogin or Poygaiyālvār, Bhūtayogin or Bhūtattālvār, Mahadyogin or Peyālvār and Bhaktisāra or Tirumalīśai-Pirān. Nammālvār or Śaṭakopa, who came in the next group, was perhaps the greatest of the Ālvārs. Others in this group included Madhurakaviyālvār, Kulaśekhara Perumāl, Viṣṇucitta (or Periyālvār) and Āndāl, his adopted daughter. In the last of the groups were Bhaktāṅghriṇū (Tonḍaradippodiyālvār), Yogivāhana (Tiruppānālvār) and Parakāla (Tirumangaiyālvār). The Divya Prabhandha constitutes the collection of the Ālvārs' compositions in the Tamil language.

Saṅkara's outlook was based strictly on philosophical thought and logic; but even he has, in numerous compositions, described the supreme entity in a personal aspect as saviour, helper, friend and guide. He wrote poems dedicated to Nr̥siṁha, Śrī Kr̥ṣṇa, Laksmī, and Annapūrṇā; and there is his celebrated lyrical homage to Pārvatī or Durga—the *Saundaryalaharī*.

Rāmānuja, of course, was concerned much more with the personal aspect. His teachings may be regarded as a reaction against the tendency to view religion on the intellectual rather than the emotional plane. He assimilated the beliefs of the Dravidian civilization and helped to encourage and promote temple worship

and public festivals. Born early in the 11th century, Rāmānuja was deeply influenced by the Tamil saints and Ālvārs—their ideas coloured his interpretation of the Upaniṣads and the Rāmānuja *Brahma Sūtra*. He put forward a theistic view of the Vedas as against the rigid Advaita point of view of Śaṅkara. Basing his thoughts on Bodhāyana and the theistic Upaniṣads, the *Mahābhārata* (including the *Bhagavad-Gītā*), *Viṣṇu Purāṇa* as well as the compositions of the Ālvārs and Ācāryas, Rāmānuja produced a number of works culminating in the *Śrībhāṣya*. He proclaimed the doctrine of salvation through *Bhakti*. His earlier followers came to be known as Vadagalais. About two centuries later the Tengalais appeared; they, unlike the Vadagalais, did not concentrate on Sanskrit scriptures and traditions and regarded Tamil scriptures as equally canonical.

There were several points of difference between Rāmānuja and early Vaiṣṇava teachers like Nādamuni and Yamunācārya. One was the importance attached to *Svāmi Kṛpā*, Grace of God. According to one school, this is spontaneous, not depending on any effort or merit of the devotee. The other school asserts that Grace also depends on the devotee's virtuous action. The religious approach of Rāmānuja was mainly based on self-surrender, which must result in universal charity and sympathy, and friendliness even to an enemy. He insisted that the performance of scriptural duties alone was not enough for salvation. Karma Yoga and Jñāna Yoga, according to the Rāmānuja school, only purify the mind in preparation for Bhakti Yoga or devotion. Rāmānuja's *Śaranāgati Gadya* is a notable contribution to the gospel of self-surrender, but it does not rule out caste functions and duties, and the doctrine of Karma.

Vedānta Deśika, the greatest successor of Rāmānuja, and a strong opponent of Śaṅkara's Advaita doctrine, wrote a very controversial work, *Satadūṣanī*. Pillai Lokācārya, the famous exponent of the Tengalai school, advocated passive surrender (*Prapatti*) in preference to active faith (*Bhakti*), and the guidance of a spiritual preceptor. Maṇavāla Mahā Muni is the chief Saint of the Tengalais. This school built up a remarkable Tamil literature to which it ascribed an importance equal to that of the Vedas—it was called the Tamil Tirumurai or the Tamil Veda. In essence, however, there was no fundamental doctrinal divergence between the two sects. Differences in certain features such as caste marks on the forehead and temple ceremonials and usage became accentuated in later years.

As the ideas of Rāmānuja spread through India, men like Madhvācārya, Vallabhācārya, Caitanya, Rāmānanda, Kabīr and

Nānak came under their spell. Rāmānuja and his followers opposed the doctrine of Māyā and the interpretation of the world as purely phenomenal or illusory. They emphasized Successors of Rāmānuja the distinction between the individual soul and the supreme Godhead and based their philosophy on man's conviction of sin, his responsibility for sin and the importance of grace emanating from the Divine. In other words, they believed that salvation comes not specially through *Jñāna* (knowledge) or *Karma* (action), but through *Bhakti* (faith) and *Prasāda* (grace). The Bhāgavata doctrine of complete resignation to God was one of the articles of their faith; and God was viewed alternately as father, mother, child, teacher and friend, and even as the beloved. Rāmānuja declared that caste had nothing to do with the soul's quality; some of the Ālvārs were in fact non-Brahmins. Rāmānuja is said to have admitted even Harijans to the temple at Melkote. One of his later followers, Rāmānanda, who lived in the 13th century, not only protested against caste distinctions but enjoined that no man should ask any devotee about his caste or sect: whoever worships God is God's own.

Later followers of Rāmānuja included a number of scholars who sustained his philosophic system through the centuries. While accepting the set rituals of initiation and worship, they admitted Jains, Buddhists, Śūdras and Harijans into their fold. A celebrated successor of Rāmānuja was Nimbārka, who lived about the same time as Madhvācārya. According to his philosophy, which is a type of Bhedābheda-vāda, that is, the theory of the Absolute as Unity-in-difference, *Brahman* or the Absolute has transformed itself into the world of matter and spirit. As the Life-force, *Prāṇa* manifests itself in the various cognitive sense functions, and yet keeps its own independence, integrity and difference, so the *Brahman* also manifests itself through the numberless spirits and matter, without losing itself in them. As the spider spins its web out of itself and yet remains independent of the web, so the *Brahman* splits itself up into numberless spirits and matter but retains its fullness and purity.

The reaction against Śaṅkara's Advaitism reached its climax in Madhvācārya's dualistic philosophy. It resembles Rāmānuja's doctrine to some extent but stands for unqualified dualism. Madhva, also known as Pūrnāprajñā and Ānandatīrtha, was born near Udupi in South Kanara in the 12th century. He draws a clear distinction between God and the individual soul, God and matter, individual soul and matter, one soul and another and one variety of matter and another. Large groups in India follow this doctrine which bases itself on the feeling of absolute dependence on God and love for Him.

Madhvācārya attacked Śaṅkara vehemently on the ground that his philosophy was a disguised variety of Buddhism. It is well known that Śaṅkara was strongly influenced by Gauḍapāda, who had great regard for the Buddhist philosophy, and it is unquestionable that, while Śaṅkara was opposed to Buddhist thought in general, he was perhaps unconsciously influenced by some of its tenets. Madhva, on the other hand, objected to Advaita: it seemed to him presumptuous for the individual soul to claim identity with *Brahman*. According to his doctrine, Viṣṇu is the only supreme being; and *Bhakti* is the primary essential for liberation. Among his great disciples was Purandaradāsa, reputed as a social reformer and one of the creators of the Karnātaka system of music. Vādi-rāja, a renowned writer, was another Madhva philosopher.

One of the most influential Vaiṣṇava cults was founded by Vallabhācārya, a Telugu Brahmin who lived in the 15th century.

He migrated to the North and in his numerous works  
Vaiṣṇavism in the North he gave an interpretation of the Vedānta differing from that of Rāmānuja, as also of Śaṅkara. He

called his doctrine Śuddha Advaita, pure non-dualism. The world is real, and not an illusion. God is *Nimitta-kārana*, the causative being. Discarding the Māyā theory Vallabhācārya asserts that God cannot be described by negatives but only by attributes, and is personified in Kṛṣṇa. He is not only *Kartā*, creator, but also *Bhoktā*, enjoyer. Though he has no need to assume a bodily form, he often does so to please his devotees. Regarding *Bhakti* as the chief means of salvation and superior to *Jñāna*, (knowledge) Vallabha opposed all kinds of asceticism. The body is the temple of God, he said. The famous Upaniṣadic precept *Tatvamasi* was, by an ingenious interpretation, modified by Vallabha as *Atatvamasi*, "That thou art not." Vallabhācārya's doctrines were fully interpreted and expounded by his son Viṭṭhala.

Later, in Northern India, there arose the Caitanya movement. Nimbārka had already elevated Rādhā, the consort of Kṛṣṇa, to the highest position. Jayadeva, the author of *Gita-Govinda*, and other poets like Vidyāpati, Umāpati and Caṇḍīdās, adopted the Rādhā-Kṛṣṇa cult. Caitanya, the great Vaiṣṇava teacher of the 15th century, transformed the Vaiṣṇava faith and extended his influence in most parts of Northern India. He accepted converts from Islām, the foremost among them being Haridās, Rūpa and Sanātana. Salvation, according to his doctrine, consists in the eternal experience of God's love. Caitanya exercised great influence over later Indian thought.

The cult of Śakti or the mother aspect of Godhead had its roots in the Vedas. The *Rg-Veda* describes Śakti as the

embodiment of power and the upholder of the universe Śakti is represented as the sister of Kṛṣṇa and the wife of Śiva.

She is worshipped as Devī, who is one with Śāktism *Brahman*. The literature of Śāktism, called the Tantra, gives a high place to women and reacts strongly against caste distinctions. According to the doctrines of the Śākta cult (embodied in the 77 Āgamas), Śiva or the supreme entity is impersonal and beyond activity. Śaṅkara in his *Saundaryalaharī* declares: "Śiva is able to create when united with Śakti; otherwise he is inert." The Śākta cult and philosophy has had great influence in Bengal and Assam, as well as in Malabār.

A variant of the Śaivite philosophy, which developed in Kashmīr, is known as the Pratyabhijñā system. Here, as Dr. Radha-krishnan says, Śiva is the subject as well as the object, the experiencer as well as the experienced. "As the consciousness on which all this resultant world is established, whence it issues, is free in its nature, it cannot be restricted anywhere. As it moves in the differentiated states of waking, sleeping, etc., identifying itself with them, it never falls from its true nature as the knower." In the strain of Advaita Vedānta it is said, "That alone in which there is no pleasure, no pain, no known or knower, nor again unconsciousness, really exists".

Sir John Woodroffe has translated a number of Tāntric texts and expounded and popularized the basic principles of Śāktism, dispelling many false ideas about Śākta observances. He has described the Śākta doctrine as the worship of the Supreme Power in the form of Mother, who creates, sustains and ends the universe; from cycle to cycle Śiva is the unchanging consciousness and Śakti its changing power, appearing as mind and matter.

Early Indian history cannot be viewed in its true perspective unless the institutions of the South receive adequate treatment. The unity of India transcends the diversities of blood, colour, language, dress, manners and sects. It is seen in the fusion of Brahminical ideas and institutions with Dravidian cults. This unity, however, has been limited by the later developments of the caste system in a manner different from the original conception which was functional in character and elastic in scope.

A typical South Indian village almost invariably has a temple dedicated to Ayyanār or Hariharaputra or to Hanumān or Ānjaneya, or to Ganeśa. On many hill-tops there are shrines dedicated to the Devī (Caṇḍī) or Kārtikeya also named Subrahmanyā. These exemplify the tolerant and assimilative outlook of the Aryans. In this context mention has already been made of the

*Vrātyastoma* (a particular sacrifice or ritual) by means of which masses of non-Aryans (*Vrātyas*) were admitted into the Aryan society.

According to South Indian tradition, Tamil was first developed by the sage Agastya, to whom a grammar, a treatise on philosophy and many other works are ascribed. The oldest Tamil grammar now extant, the *Tolkāppiyam*, is said to have been the work of one of his disciples. The Śaivite and Vaiṣṇavite revival due to the Brahmins in Southern India, since the 8th century, brought about a counter-movement among the Jains. Early Buddhism in Northern India adopted the Prākrit or vernacular speech for its religious treatises. On the same analogy, Buddhism and Jainism in the South created works in the dialects of the people. The Dravidian Buddhists and Jains created a Tamil literature which was anti-Brahminical in sentiment and covered the period between the 9th and 13th centuries.

The *Kuṛaḷ* of Tiruvalluvar, dating not later than the 10th century A. D. is said to have been the work of a poet belonging to the depressed classes. It enforces the Sāṃkhya philosophy in 1,330 poetical aphorisms based on three subjects: wealth, pleasure and virtue. To the sister of its author, the poetess Avvaiyār, are ascribed many compositions of the highest moral tone, and they have enjoyed perennial popularity in Southern India. The Jain period of Tamil literature includes works on ethics. In the same period a celebrated adaptation of the *Rāmāyaṇa* was composed in Tamil by Kambar. This is a Tamil paraphrase rather than a literal translation of the ancient Sanskrit Epic.

Between this period and the 16th century, two encyclopaedic collections of Tamil hymns, deeply religious in spirit, were gradually formed. One collection was the work of a Śaivite devotee and his disciples who sought to uproot Jainism. Vaiṣṇavite apostles of that same period were equally prolific in Tamil religious songs. Their Book of Four Thousand Psalms, *Nālāyira Prabandham*, constitutes a hymnology dating from the 12th century.

The development of Vaiṣṇavism saw a parallel development of the Śaiva theism. A distinctive philosophy of Śaiva Siddhānta was evolved about the 11th century. The Śaiva Śaivite sects Āgamas were based on the Vedic concept of Rudra.

The large number of inspired writers in the Tamil country were headed by Māṇikkavāśagar. All their works have been collected and are venerated by the South Indian Śaivites. The first part of this collection, Tēvāram, contains the hymns of Appar, Sambandar and Sundarar. The second part mainly comprises Māṇikkavāśagar's Tiruvāśakam. Sixty three Śaiva saints are

recognized and their lives are recounted in the *Periya Purāṇam* of Śekkīlār.

Dr. Pope, the well known Tamil grammarian, has stated that Śaiva Siddhānta is one of the most influential and intrinsically valuable of the religious writings in India. The Siddhānta recognizes three entities: God, the Soul or the aggregate of souls, and Bondage (*Pati*, *Paśu* and *Paśa*). The expression Bondage denotes the aggregate of these elements which fetter the soul and hold it back from union with God. In one of its aspects it is *Malam*, the taint clinging to the soul. In another aspect it is *Māyā*, the material cause of the world. The peculiarity of the Śaiva Siddhānta doctrine which calls itself Śuddhādvaita is its difference from the Vedānta Monism. God pervades and energizes all souls and, nevertheless, stands apart. The concept of the absolute is clear from the Tamil word for God, *Kaṭavul*, meaning that which transcends (*kada*) all things and is yet the heart (*u*) of all things. When the absolute becomes manifest, it is as Force (*Sakti*) of which the universe is the product. The Dvaita system, on the other hand, insists on a radical pluralism, and at the same time on the complete dependence of the souls and the world on God.

One of the important Śaivite sects known as Vīraśaiva was founded by a Brahmin named Basava, who was for some time the minister of a ruler in Kalyān. The *Basava Purāṇa* outlines Basava's life. This as also Basava's own writings in Kannada, describes the fundamentals of a doctrine based on rigid monotheism, Śiva being regarded as the supreme, limitless and transcendent entity. *Brahman* is the identity of "being", "bliss" and consciousness, and devoid of any form of differentiation. It is limitless and beyond all ways of knowledge. It is self-luminous and absolutely without any barrier of knowledge, passion or power. It is in Him that the whole world of the conscious and the unconscious remains, in a potential form untraceable by our senses, and it is from Him that the whole world becomes expressed or manifest of itself, without the operation of any other instrument.

The Vīraśaivas, often called Lingāyats, are distinguished by the *Śivaliṅga* and *rudrākṣa* on their person and they smear their bodies with ashes. They are strict vegetarians and abstain from drink. The Vīraśaiva doctrine has four schools; but the differences are of a minor kind. All believe in the efficacy of a *Guru*, preceptor. All assert the reality of the Universe and unity with Śiva, the only ultimate reality. The Vīraśaiva doctrine is prevalent in Mysore and in the southern regions of Mahārāshtra.

Side by side with these philosophical systems, a large body of devotional literature in the spoken languages of India developed.

**Great movements of reform** This was due to the advent of great reformers—Rāmānanda, Kabīr, Nānak, Mīrābāī, Vallabhācārya, Caitanya, Tulasīdāsa, and Tukārām. Rāmānanda and his Muslim disciple Kabīr emphasized the belief in a supreme deity and recognized no caste distinctions, although they accepted the doctrines of Karma and *Samsāra*. Nānak founded the religion of the Sikhs. He was under the influence of Islām as well as of Hinduism and, like Kabīr, he believed in Karma and *Samsāra*, *Māyā* and *Mokṣa*. He laid great stress on a personal God and a society of disciples not bound by caste or race restrictions. The militant character of Sikhism was a later development due to Aurangzeb's intolerance.

The great saints of Mahārāshtra and Bengal created a wonderful literature of Bhakti based on the worship of Rāma or of Krṣṇa. Vallabhācārya, in particular, attacked Śaikara's Advaita doctrine. He preached that by God's grace alone can man obtain release. Caitanya, a contemporary of Vallabha, and his followers called Goswāmis, were itinerant preachers whose sincerity of religious experience brought about a reformation in Bengal. The common features in Bhakti cults have been pointed out by D. S. Sarma in his *Renaissance of Hinduism*:

1. Belief in one supreme God of Love and Grace.
2. Belief in the individuality of every soul, which is nevertheless part of the Divine Soul.
3. Belief in salvation through *Bhakti*.
4. The exaltation of *Bhakti* above *Jñāna* and *Karma*; and, above all, the performance of rites and ceremonies.
5. Extreme reverence paid to the *Guru*.
6. The doctrine of the Holy Name.
7. Initiation through a *mantra* and a sacramental meal.
8. The institution of sectarian orders of *Sannyāsins*.
9. The relaxing of the rules of caste, sometimes even ignoring all caste distinctions.
10. Religious teaching through the vernaculars.

It was out of these Bhakti cults that the Sikh group transformed itself into a military brotherhood. Bhakti cults gave rise to such works as the *Rāmāyaṇa* by Tulasīdāsa, the *Abhaṅga* of Tukārām, and the poems of devotees like Rāmprasād of Bengal and Tāyu-mānavar of South India. All these helped to popularize the spirit of devotion and resulted in a great religious revival in many parts of India.

In the 18th century religion suffered a serious decline. Then came the impact of a completely different civilization. English education destroyed the isolation of India and brought about an active ferment. Many Indians of the time became either sceptics who leaned towards Christianity, or reactionaries who sought to preserve at any cost the ancient forms and institutions. Fortunately, at this time, enlightened Europeans like Sir William Jones, Sir Charles Wilkins, Colebrooke, Monier-Williams and Max Müller revealed by translation the treasures of ancient Indian wisdom. Their work was later supplemented by art lovers and art critics, who revealed the secrets of sacred and secular art-forms and concepts.

As an outcome of these influences and counter-influences, there arose a series of movements which have been rightly described as a renaissance of Hindu life and thought. Raja Rammohun Roy was the most outstanding pioneer of these movements. He struck a note of universalism in tune with the spirit of the *Upaniṣads*. Born in Bengal in 1772, he studied Persian, Arabic and English. In 1803 he published a book in Persian, with a preface in Arabic, entitled *Tuhfat-ul-Muwahhidin*. It carried a protest against idolatry and sought to establish a universal religion based on the idea of the unity of Godhead. He started a controversy with the Christian missionaries and published a book in which he tried to separate the moral teachings of Jesus from the miracles described in the Gospels. Rammohun Roy, along with David Hare, stressed the necessity of education in India on modern lines, in opposition to those who objected to English education and insisted on a return to the past. He repeatedly declared that he had no intention of breaking away from the ancestral religion, and wished to see it restored to its original purity. In order to carry out his ideas he founded the Brāhma Samāj on the basis of theism. The Trust Deed of the Samāj laid down that "no graven image, statue or sculpture carving, painting, picture, portrait or the likeness of anything shall be admitted within the building."

Debendranath Tagore, the next great leader of the Samāj, formulated the *Brahmopadeśa*, comprising tenets from the *Upaniṣads* and *Tantras*. His successor, Keshub Chandra Sen, sought to incorporate Christian ideals into the Brāhma Samāj movement. He began the compilation of a scripture including passages from the Holy Books of many religions—Hindu, Buddhist, Hebrew, Christian, Muslim etc. When he went to England in 1870, he was welcomed by many Christian organizations. As the result of secessions in the Brāhma Samāj, three institutions arose: The Ādi Brāhma Samāj; the New

The Brāhma  
Samāj

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Dispensation of Keshub Chandra Sen; and the Sādhāraṇ Brāhma Samāj founded by dissenters from the Keshub church. The Sādhāraṇ Samāj, led by Shivanath Sastri and Ananda Mohun Bose, gave a rational, monistic interpretation of the Upaniṣads, admitting the essential unity of the universal self and the individual self. The following doctrines, as noted in *Renaissance of Hinduism*, are common to all these varieties of the Brāhma Samāj :

1. They have no faith in any scripture as an authority.
2. They have no faith in *Avatārs*.
3. They denounce polytheism and idol-worship.
4. They are against caste restrictions.
5. They make faith in the doctrines of Karma and Rebirth optional.

An offshoot of the Brāhma Samāj, the Prārthanā Samāj, was founded by Justice Ranade in Bombay. Its programme included disapproval of caste, recognition of widow marriage, and the encouragement of women's education. Dr. Atmaram Pandurang, Pandita Rama Bai, S. P. Kelkar and S. P. Pandit were the principal exponents of this Samāj.

As a reaction against the influence typified by Raja Ram-mohun Roy and Justice Ranade, the Ārya Samāj was founded by Swami Dayanand Saraswati. It attacked the Brāhma Samāj for its pro-European and pro-Christian attitude.

The Ārya Samāj is a great Sanskrit scholar and a believer in the doctrines of Karma and Rebirth. Swami Dayanand sought to revive the Vedic ideals and laid stress on *Brahmacarya* and *Sannyāsa*. He believed implicitly in the ancient scriptures, disavowing Purāṇic Hinduism in favour of Vedic Hinduism—the Purāṇic texts, he said, had no Vedic sanction. Holding the Vedas alone as authoritative, he stated that God and the human soul are two distinct entities, different in nature and attributes, though they are inseparable from each other as the pervader and the pervaded. The doctrine of Karma and *Saṁsāra* is of course accepted by the Ārya Samāj. One of its main activities is *Suddhi*, a purification ceremony, by which non-Hindus are converted to Hinduism. The depressed classes and Harijans are invested with the sacred thread and are given equal status with other Hindus. The Ārya Samāj also reclaimed many Hindus who had been converted to Islām and Christianity. *Sanghaṭan*, organization of the Hindus for self-defence, is one of the main principles of the Ārya Samāj, and it has played its part as the church militant in the Hindu fold.

The Theosophical Society, founded in 1875 by Col. Olcott and Madame Blavatsky, co-operated with the Ārya Samāj and tried for

a time to organize Indian life on national lines and check the activities of Christian missionaries. Col. Olcott and Madame

Theosophical Society Blavatsky went later to Ceylon, declared themselves Buddhists, and took part in a movement for the revival of Buddhism. Dr. Annie Besant joined the

Society after a period of militant agnosticism, notable social service, and political work amongst the Fabians in England. She became the head of the Society in 1891. Claiming that she had been a Hindu in her former birth, Annie Besant worked throughout her life for the regeneration and activization of Hindu thought and Hindu life. She published a translation of the *Bhagavad-Gītā* along with Dr. Bhagvan Das and popularized Hindu ideals in her numerous publications. A defender of many orthodox ideals, she turned later to social reform, which included the partial modification of the caste system. One of the main principles of Theosophy is the belief in a brotherhood of great teachers of the past who are supposed to be living still, watching over and guiding the evolution of humanity. The Theosophical Society under Dr. Besant's guidance spread the fundamental principles of the Hindu religion—Karma, Reincarnation, Yoga and spiritual evolution.

Sri Ramakrishna Paramhamsa, a great devotee and mystic, had a broad outlook of universalism. After accepting the discipline of Yoga and Tāntric *Sādhana*, he underwent the discipline of the Vaiṣṇava, the Christian and the Islāmic ways of life. To rouse the religious feelings of the worldly-minded and re-affirm the ancient truths of Hinduism by an appeal to experience, he trained a devoted band of followers, the most outstanding of whom was Narendranath, Swami Vivekananda.

Sri Ramakrishna's teachings were neither new or heterodox. As Swami Vivekananda said on one occasion, Ramakrishna brought old truths to light. He was the embodiment of the past religious thought of India. Like other great religious teachers of the world, he projected his ideas through parables or images. Questioned, for instance, on the problem of evil, Sri Ramakrishna said: "Evil exists in God as poison in a serpent. What is poison to us is not poison to the serpent. Evil is evil only from the point of view of man." In other words, from the absolute standpoint, there is no evil, but from the relative standpoint evil is a terrible reality. Ramakrishna preached that realization is the essence of religion; and that all religions are paths leading to the same goal. He deprecated metaphysical subtleties and insisted on deep devotion—it was, he said, through his intense devotion to the image of the Divine

Mother in Dakshineswar that realization had come to him. Swami Vivekananda said: "If men like Śaṅkara, Caitanya and Ramakrishna found image worship helpful, there is no sense in declining it."

Ramakrishna's religion and the movement he founded by gathering around him a band of devoted workers were essentially practical. This aspect was expounded and universalized by Swami Vivekananda. Under the inspiration of Ramakrishna, he changed from scepticism to realization and travelled all over the world, preaching the essence of the truths of Hinduism. He dedicated himself to the service of India and particularly to the service of those who were starving, depressed, or beyond the social pale. The work for the uplift of the Indian masses was for him as important as meditation or Yoga.

At the Parliament of Religions in Chicago, Swami Vivekananda struck a note of universal toleration based on the Hindu belief that all religions lead to the same God. He also declared in Chicago that the religion of the Hindus is centred on self-realization; idols, temples, churches and books are aids and nothing more.

Swami Vivekananda strengthened the Ramakrishna organization by founding monasteries and centres of Hindu teaching in India and abroad. He reinterpreted Hinduism and stated that the abstract Advaita must become living. All through his life and especially during his travels abroad, he insisted that the essential features of Hinduism are its universality, its impersonality, its rationality, catholicity and optimism. Above all, its authority is not affected by the historicity of any particular man. Swami Vivekananda told his countrymen that they had become weak and miserable because they did not bring their Vedānta out of the books into life itself. His great contribution to Hinduism lay in applying the Hindu creed to the elevation of the masses and abolishing India's isolation from the world, culturally, spiritually, and in many aspects of social life. He founded a great and worldwide organization, the Ramakrishna Mission, which has worked for the spiritual welfare and multiform amelioration of the people of India and other countries.

Sri Aurobindo Ghosh, one of the latest exponents and interpreters of Hinduism, has described ancient Indian philosophy as follows: "an ingrained and dominant spirituality, Sri Aurobindo an inexhaustible vital creativeness and gusto of life, and, meditating between them, a powerful, penetrating and scrupulous intelligence, combined with the rational, ethical and aesthetic mind at a high intensity of action, created the harmony of the ancient Indian culture." Sri Aurobindo gave new

interpretations of the Vedas and the Vedānta, and in his *Essays on the Gītā* he expounded what he called "the integral view of life." His great work, *The Life Divine*, is a summing up of his philosophy of "the Descent of the Divine into Matter." The importance of Sri Aurobindo's mission lies not only in his restatements of old ideals but also in his attempt to explain the true methods of Yoga as apart from mere asceticism and illusionism.

In the popularization of ancient Hindu ideals, Rabindranath Tagore and Mahatma Gandhi have played significant parts. Tagore has made a suggestive interpretation of the Vedic religion and the substance of the Upaniṣads. The teachings of Mahatma Gandhi have led to vast social changes and to the uplift of the backward and depressed classes. He has stated that his whole religion is based on a surrender to the will of God, the spirit of renunciation as embodied in the 'Isā Upaniṣad', the *Gītā* and the ideals of practical service. He has given a new interpretation to the doctrine of non-violence which is as old as Hinduism, and tried to adapt it by means of *Satyāgraha* to political and moral issues.

Mahatma Gandhi worked for the uplift of the depressed and backward classes and for the creation of national entity. Speaking in Travancore on the Temple Entry Proclamation enacted there in 1936, he said :

"These temples are the visible symbols of God's power and authority. They are, therefore, truly called the houses of God, the houses of prayer. We go there in a prayerful mood and perform, first thing in the morning after ablution, the act of dedication and surrender. Scoffers and sceptics may say that all these are figments of the imagination, that we are imagining God in the images we see. I will say to these scoffers that it is so. I am not ashamed of confessing that imagination is a powerful factor in life.

Now you can easily understand that, in the presence of God, the Ruler of the Universe, who pervades everything, even those whom we have called the lowest of the low, all are equal."

A recent example of transcendental spiritual experience manifested in life is Shri Ramana Maharsi, who passed away in 1950. A man of powerful personality, he taught as much by his silence as by his sermons. He had a directness of approach and a universality of outlook, which were products of true enlightenment.

It may be noted that the comprehensive tolerance of Hinduism is exemplified remarkably in such instances as the following. In the temple of Dharmasthala in South Kerala the chief personage

is a Jain—he is regarded as a hereditary oracle whose arbitration is sought by members of all Hindu and even Muslim communities.

The temple itself has the Śivaliṅga as well as the  
 The spirit of Śālagrāma, or symbol of Viṣṇu, the officiating priest  
 tolerance being a Vaiṣṇavite. In the shrine at Udupi the worship of Śiva and Viṣṇu alike is offered and the heads of the Udupi Mutts, although staunch Vaiṣṇavites, are under the obligation to attend to two Śiva shrines, in addition to officiating as the chief priests of the Kṛṣṇa temple. It is believed that a person belonging to the Harijan community received special divine favour and attained union with God in the temple precincts. The tradition of Chidambaram is similar: the Paraya saint, Nandan, who was refused admission by the Brahmin priests, became the object of divine favour and attained communion with God. In the temple of Jagannāth at Puri, caste distinctions have been discarded. In Travancore there is a forest temple dedicated to Ayyappa or Hariharaputra—here, too, no caste distinctions are observed. Hindus, and even Muslims and Christians, perform vows in this shrine with belief in the efficacy of the god's protective help. It may be noted in this context that the usual invocation of Ayyappa, namely, *Śaraṇam Ayyappa*, is reminiscent of the Buddhist prayer.

## 2. *Buddhism*

Buddhism today is a living religion in the East Asian and South East Asian countries but in the land of its origin, India, it claims a little over 3 million followers. Gautama Buddha, the founder of the religion, was born in 566 B.C. (according to Ceylonese tradition, 624 B.C.) at Kapilavastu in the Nepalese *tarai*, about 20 km. from Nautanwa. He came of a ruling family of the Śākyā clan. At the age of sixteen he married Yaśodharā (*alias* Gopā), daughter of the chieftain of a neighbouring clan, the Koliyas. He enjoyed family life for thirteen years and had a son, Rāhula. But amidst all the pleasures of the palace he had an intense urge to find a way out of the sufferings that are the inevitable lot of man. In his 29th year he gave up wordly life, wandered about for a time as a mendicant, and then received his early spiritual training at Rājagṛha (capital of Magadha) under the renowned teachers Ārāḍa Kālāma and Rudraka Rāmaputra.

For six years Gautama went through the extreme forms of asceticism, and then realized that they were of no avail. Abstinence from food had only made him physically weak. He then decided

to give up rigorous asceticism and accepted the milk-food offered by Sujātā. Having regained strength, he sat cross-legged under a "Bodhi" tree on a seat of dried grass, meditating with an unflinching resolve to realize the Truth. At last, came his enlightenment. The Truth dawned upon him that "worldly beings are dynamic in nature and consequently, subject to sufferings, and there is a way out of the sufferings". For a period of seven weeks "Buddha", the Enlightened One, pondered over that realization, then set out to preach his doctrines. He went first to Vārānasi (Sārnāth), then to Uruvilvā and other places. He travelled through Bihār and Uttar Pradesh for forty-five years, preaching, converting, organizing a group of disciples and framing rules for the monastic system of life. At the age of eighty he died at Kasia (486 B. C.; according to Ceylonese tradition, 544 B. C.).

Born and brought up in the Brahminic tradition, Gautama Buddha opposed the religious rituals and ceremonies of the Brahmins, the sacrificial system which involved animal-killing, and the rigid code of caste restrictions. He believed that the religious practices and spiritual achievements should be open to all; that, self-exertion and self-reliance and not dependence on others, even on gods, was the only way for human progress; and that, rituals were a hindrance rather than an aid for spiritual development.

His first discourse to his companions, the five Brahmins, contained the gist of his teachings, which may be analysed as follows :

The Middle Way is to be followed, eschewing the two extreme ways, viz., indulgence in luxuries along with dependence on the sacrificial system for gaining spiritual benefits, and hard physical austerities. The Middle Way comprised the disciplined life of a recluse asking for the bare necessities of life, and the practice of the Eightfold Path which included ethical teachings, mental control and acquisition of knowledge or Realization of the Highest Truth.

The ethical teachings or *Sīla* have the strongest emphasis in Buddhism. *Sīla*, the root of spiritual life, is the basis of mental control as well as realization of the Truth. The observance of Five Precepts is the primary condition for all Buddhists. These are abstinence from killing, stealing, speaking falsehood, immorality, and intoxicating drinks. The monks and nuns, however, have many more precepts to follow; these include the 227 rules set down in the *Pātimokkha*.

Mental control involves the practice of the four types of constant awareness relating to one's body, mind, feeling and spiritual acquisitions. Quietude and introspection are necessary for monks.

But this Yogic *sādhanā* is only a preparation for the mind to attain the Higher Truths.

True knowledge, or realization of the highest truth, is centred on three watchwords; suffering, impermanence and substancelessness of all constituted beings. Suffering also includes the acquisition of wealth and progeny, since these ultimately become sources of pain. Impermanence arises from the dynamic nature of all worldly beings and objects. Substancelessness is the absence of permanent soul (*ātman*) as conceived by the Brahminic thinkers; in other words, a constituted being has nothing that is without decay.

The crux of Buddhist philosophy is the denial of the existence of a permanent, unchangeable soul. Mind and matter (*nāma-rūpa*) constitute a being, and mind has four states. Each Philosophy of these five constituents is subject to constant, momentary changes. At death and rebirth the changes are drastic—from gross to subtle and then from subtle to gross. A being is continuous and unlimited, with no beginning or end; the continuity of existence ceases only when one has realized the Truth.

The momentary change in the constituents is controlled by the law of causation. The origin of a being or thing is dependent on something else; the cause ceases the moment it produces an effect; it cannot pass into effect; hence, the relation of cause and effect is only that of consecutiveness. *Nirvāna* is eternal, unchangeable, without origin and decay.

The Buddha's teachings and philosophy are embodied in the Tripitaka comprising the *Sutta*, *Vinaya* and *Abhidhamma Piṭakas*.

The *Sutta Piṭaka* is a collection of sermons on ethics The Tripitaka and doctrines; the *Vinaya Piṭaka* contains the rules of conduct for the orders of monks and nuns; and the *Abhidhamma Piṭaka* is an exegesis on the doctrinal teachings and deals also with psychology and metaphysics. The Buddha delivered his discourses probably in the dialects of Magadha and Kosala. The discourses were handed down orally and were compiled in Pāli, Prākrit and Sanskrit in the pre-Āśokan times.

Soon after the passing away of the Buddha, the First Council was convoked at the instance of Mahākassapa who became its President. It was held at Sattapāṇīguhā in Rājagṛha. The main object of the Council was to collect the scattered sayings of the Teacher. Ānanda, the Buddha's constant companion, was designated as the reciter of the discourses while Upāli had charge of the disciplinary rules. The former collection was called *Sutta Piṭaka* (it included *Abhidhamma Piṭaka*) and the latter, *Vinaya Piṭaka*.

The *Sutta Piṭaka* contains discourses delivered by the Buddha during the forty-five years of his missionary career. These comprise expositions of ethical, meditational and philosophical teachings, and deal incidentally with the contemporary religions, ascetic practices, social customs and beliefs. The collection is divided into five books (*Nikāyas*) called *Dīgha*, *Majjhima*, *Samyutta*, *Anguttara* and *Khuddaka*. The first two contain mainly the discourses. In the third the discourses are arranged according to topics, while in the fourth they are classified numerically, i.e., according to the number of items appearing in the discourse. The fifth is a miscellaneous collection of early and late texts, which could not be included in the previous four.

The *Abhidhamma Piṭaka* is more or less an exegesis of the doctrinal matters discussed in the *Sutta Piṭaka*. It contains seven treatises dealing with psychology, meditation, logic, controversies and commentarial expositions. Some of the treatises were compiled after the Buddha's death, and so this *Piṭaka* had its beginning in the First Council when it was treated as a part of the *Sutta Piṭaka* and completed in the Third Council.

Since the Buddha had also to organize his monastic system, he laid down from time to time rules for the guidance of the monks. These are collected in the *Vinaya Piṭaka*. Its nucleus is the *Pātimokkha Sutta*, which embodies 227 rules especially prescribed for regulating the life of monks and nuns. As the monastic system had a democratic basis, the Buddha had to frame a number of rules for the constitution of the *Saṅgha* and its ecclesiastical acts, as also for the chapter of monks empowered to punish delinquent monks and absolve offences.

After the Buddha's demise there was no supreme head of the monastic organization to maintain concord and uniformity among

the monks and nuns scattered in localities far from  
The Second one another. In the course of a century, after the  
Council

First Council, there appeared among the monks difference of opinion in the interpretation of *Dhamma* and *Vinaya*. A sharp conflict of opinion occurred between the monks of Vaiśālī and those living in the western regions. The former introduced certain laxities in disciplinary rules. These were declared illegal and suppressed by the monks of the western regions, the Theravādins. The dissidents, however, held another Council to legalize the laxities and formed a new sect called the Mahāsaṅghikas. The laxities were not the only reason for the split in the *Saṅgha*. The dissentients made changes in the *Tripitaka* collection as also in the doctrines. The basic changes in the latter were : deification of the Buddha; non-recognition of the Arhats as perfect; and the

development of the Bodhisattva cult which made it possible for the laity to gain certain virtues leading to Buddhahood. The goal envisaged by the Mahāsanghika was the attainment of Buddhahood and not merely of Arhathood, as was the goal of the Theravādins.

There were seven subsects of the Mahāsanghikas. Most of them were concentrated later in the Andhra country and were collectively called the Andhakas. They developed new doctrines and paved the way for the advent of the Mahāyāna system.

The orthodox Theravādins were also subdivided into eleven sects of which two differed from the parent sect in fundamental doctrines and the remaining nine in psychological interpretations, disciplinary rules, modes of dress and minor doctrines. Of the two sects with major differences the Sarvāstivādins were more important, as they surpassed the parent sect in popularity, philosophical depth and cultural contributions. They gave preference to Sanskrit and had their Piṭaka and subsidiary works in Sanskrit. Their centres were in Mathura, Gāndhāra and Kashmir. As apparent from their name, the Sarvāstivādins were realists (*sarvam asti*) but this realism was not materialism. It maintained that the present contains pastness and futurity; in other words, the elements composing a being or an object, whether material or spiritual, are dynamic in their nature. One momentary state is different from the next but they are not devoid of the effects of the past and the potentiality of the future.

The other important sect, the Sāmmitiya or Vātsiputriya, became popular in the western regions and gained the support of King Harsavardhana. It subscribed to all the doctrines of the Theravādins except that it believed in an entity or soul (*pudgala*) apart from the five constituents. This entity, however, was not permanent as conceived by the Vedāntins and underwent changes from birth to birth along with the constituents. *Pudgala*, according to this sect, explains the continuing but changing individuality. It, however, ceases to exist in *Nirvana*. The Theravādins held the view that the past ceases completely and cannot give rise to the present, nor the present to the future; there can be no transmission of one to the other, wholly or partially, since that would go against the *Anityatā* or *Kṣaṇikatva* (momentary impermanence) theory of the Teacher. To conceive of a sixth constituent was unwarranted by the teachings of the Buddha, who was emphatic in his assertion that there were only five constituents in a being and that there was no soul (*ātman*), permanent or temporary.

The various sects, it should be noted, mostly dwelt in the same monastery but avoided performance of ecclesiastical acts and ceremonies in common.

The Third Council was held at Pātaliputra under the auspices of Emperor Aśoka, who was more or less in favour of the Theravādins. According to tradition, Aśoka wanted all The Third Council monks of different sects to observe the fortnightly Pātimokha assembly at one and the same place and time. The condition precedent to such assemblies is that all monks must declare themselves as pure both in doctrine and discipline; and the declaration must be accepted by all the members present. The monks of one sect refused to accept the declaration of purity of the monks of another sect. Aśoka, intervening, compelled the non-Theravādins to give up their robes. Encouraged by his support, his spiritual adviser Moggaliputta Tissa compiled a treatise, called the *Kathāvatthu*, in which he refuted most of the non-Theravāda views. This book was incorporated in the *Abhidhamma* and its text recited along with the other texts of the Tripitaka, so that it received the seal of sanctity and antiquity. In this Council the three Pitakas, including the new treatise compiled on the occasion, were rehearsed as usual and confirmed.

The Fourth Council is ignored in Pāli tradition, recognized only by the Sarvāstivādins; but it is found in Sanskrit, Tibetan and Chinese traditions. This Council also was an outcome The Fourth Council of the sectarian differences. Emperor Kaniṣka became a follower of Buddhism but was perplexed by the varying interpretations of the Master's words. He, therefore, decided to convoke a Council to which monks of all sects were invited. He wanted to have all the different opinions recorded in the proceedings of the Council. But it so happened that the Council, held in Gāndhāra, was attended largely by Sarvāstivādins. In the Council voluminous commentaries (*Vibhāṣās*) on the three Pitakas were prepared. The *Vibhāṣās* were compositions of Sarvāstivāda scholars, according to their own light. So the Sarvāstivādins were given a new name, Vaibhāṣika. The original *Vibhāṣās* are lost and are now available only in Chinese translations.

A distinctive feature of Buddhism was the monastic system of life prescribed for monks and nuns. The system was organized on a democratic basis without any succession of headship Monasticism of the Church. The monks and nuns had to live on alms collected in the forenoon, could own just three pieces of saffron-coloured robes, and observe the 227 rules of the *Pātimokha Sutta*. Their main tasks were study and meditation. The young monks (*Śrāmanas*) were placed under an Ācārya and *Upādhyāya*. Some of the monks became scholars and wrote treatises on logic, philosophy and psychology. Some gained

mastery in dialectics. Many Brahmins joined the Buddhist order and made valuable contributions to Buddhist thought.

Apart from the monks and nuns, there was a body of lay devotees, *Upāsakas*, who endowed the monasteries and *stūpas* and helped to maintain the recluses. Among them were kings, ministers and rich merchants. Special discourses were held for the enlightenment of these lay devotees.

The monasteries stood away from inhabited localities but not too far from them, since the collection of alms was imperative. Those at Taxila, Nālanda, Valabhī and Nāgārjunikonda turned into renowned academic universities providing courses of study in the humanities and the medical science. Many other monastic cities have been unearthed by the Archaeological Department and mention may be made particularly of Mathura, Śrāvastī, Rājgīr, Sārnāth, Bhārhut, Sānchi and Amarāvati. The magnificent cave temples and monasteries at Ajanta, Kārlā, Nāsik, Pitalkhorā, Bhājā and Kondāne should also be noted. These establishments produced monks and nuns who became the inspired torch-bearers of Buddhist culture not only within India but in foreign lands also. It was when their numbers dwindled and their integrity was lost that the decline of Buddhism began.

During one hundred and forty years after Buddha's demise, the Buddhist monks could not maintain either concord among themselves or the high ideal and integrity of the earlier days. There was also a fall in the number of lay devotees as also diminution in their reverence for the monks.

Buddhist revival was initiated by Emperor Aśoka. He stopped the tradition of daily feeding of Brahmins and weeded out the pseudo-Buddhist monks. Apart from erecting *stūpas* and new monasteries, Aśoka rendered the greatest service to Buddhism by spreading its ethical teachings through his edicts and by sending out missions. Fired by the new spirit he created, the monks in course of time propagated their faith throughout Eastern Asia.

As the empire of Aśoka broke to pieces, the north-western part passed into the hands of the Greco-Bactrians, and Central India to Puṣyamitra. The Greco-Bactrians retained their national cult and forms of worship, and might have influenced the introduction of worship of the Buddha image, disapproved by the earlier Buddhists. The only Bactrians who came under Indian influence were Heliodoros and Menander. The former, Greek Ambassador of Antialkidas (125-100 B. C.), became a devotee of Viṣṇu and erected a pillar with a Garuda at its crown in honour of Vāsudeva. Menander (163-150 B.C.), ruler of the Bactrian dominion in India, accepted conversion to Buddhism.

Puṣyamitra celebrated the *Aśvamedha* sacrifice as a token of his sovereignty. The Śunga rulers were staunch adherents of Brahminism; some of them were Viṣṇuites. In all Buddhist traditions Puṣyamitra is described as a persecutor of Buddhism, but he could not retard its progress. Archaeological discoveries prove that, during the Śunga period, magnificent *stūpas* with remarkable sculptural works were erected at Sānchi, Bhārhut, Buddh Gaya and Amarāvati. Among the donors were a few petty rulers of the Śunga period, like Vedapāla and Bahasatimitra who built shrines and monasteries at Mathura and Kauśāmbī.

Buddhism underwent a distinct change towards popular Mahāyāna during the Śaka-Pahlava period. The conception of Maitreya, the future Buddha, and of Amitābha, the eternal Buddha, appealed to the Indian mind inclined to faith and devotion. Of the many Hinayāna sects, the Dharmaguptas, an offshoot of the Theravādins, were mainly responsible for the evangelization of China through Central Asia. The Dharmaguptas, permitted, as against the practice of the Theravādins, the recitation of Piṭakan texts in common by the monks and the laity. According to Chinese traditions they were responsible for the addition of the *Dhāraṇī Piṭaka* and *Bodhisattva Piṭaka* to the three Piṭakas; this implies that they were semi-Mahāyānic.

Buddhism secured the support of the Kuṣāṇa king, Kaniṣka who helped the propagation of the Faith in Central Asia. In Peshāwar, his capital, he erected a tower to enshrine the Buddha's relics. A gilt relic casket has also been discovered in Mahāsena's Saṅghārāma. He erected the famous Dharmarājika Stūpa, the ruins of which still exist. During the reign of Kaniṣka, several monks and lay devotees, as the inscriptions indicate, gave donations to the Buddhist *Saṅgha*. At the end of Kuṣāṇa rule Buddhism suffered badly in the North at the hands of foreign invaders.

Buddhism in its early period was introduced from Kalinga into Andhra, and fared well during the reign of the Sātavāhanas. The rock-hewn caves, converted into sanctuaries and dwelling cells for monks at Pitalkhorā, Nāsik, Bhājā, Kondāne and Kudā are remarkable. The austere types of cells indicate that the monks and nuns led the hard life of recluses, studying and teaching the Piṭakas.

In the 3rd century A.D. the Krishna-Guntūr region was taken up by the Ikṣvākus or Śriparvatīya Andhras, whose ancestors had been feudatories of the Sātavāhanas. During their reign donations were given to the *stūpas* and monasteries at Amarāvati, Nāgārjunikonda and Jaggeyapeta.

The Mahāsaṅghikas, who made Nāgārjunikonda their main centre of activity, propounded semi-Mahāyānic ideas, viz., that

the Buddha was transcendental (*lokottara*) and not a human being; Siddhārtha Gautama was only a created body of his; and whatever he had done carried the purpose of making the people believe that human beings could rise to Buddhahood. The Mahāsaṅghikas were, in fact, the forerunners of the Mahāyānists, though philosophically they were Hinayānists. Their ideal of Buddhahood in place of Arhathood was taken up by the Mahāyānists. But the latter re-oriented the views and propounded almost a new doctrine. The Mahāyānists held that "impermanent existence" was a contradiction in terms, since existence must always be real, unchanging and everlasting. The phenomenal world, which appears to have a fleeting existence, is actually imaginary and not real; hence, the phenomenal world and its beings are dream-like, and non-existent. There is one and only one reality, unoriginating, undecaying, unchanging and ever existent. It is the absolute not to be described by conventional terms and devoid of all attributes, and the only term applicable to it is *Śūnyatā*, the Reality devoid of attributes. This Reality or *Śūnyatā* is identical with Buddhatva, or Tathāgatahood. In common phraseology it may be called *Dharmakāya* or Buddha's universal body, which is as expansive and infinite as the universe.

In order to explain Gautama Buddha's worldly existence, the Mahāyānists devised a body called *Nirmāṇakāya* or created body, which is apparitional and unreal, a make-believe to human beings. In between the two, *Dharmakāya* and *Nirmāṇakāya*, they devised another body, *Sambhogakāya*, which is also unreal, but it is a glorious, resplendent, divine body to be visualized only by the spiritually advanced disciples who have stepped into Bodhisattvahood. An idea of the *Sambhogakāya* can be obtained from the crowned, heavily ornamented, gorgeously dressed images of Bodhisattvas, discovered by the Archaeological Department.

The Mahāyānic conception of *Śūnyatā* throws out of focus all the analytical studies, spiritual practices and acquisitions of the Hinayānists, as all these were relegated to the non-existent phenomenal world. Nevertheless, the Mahāyānists would not deny their value and efficacy in normal worldly existence; so they incorporated everything Hinayānic into Mahāyāna scriptures with the proviso that those should be realized as ultimately non-existent. To be precise, they recommended Hinayānic meditational practices to their disciples but at the same time warned them that those were not to be regarded as really efficacious.

The fundamental doctrinal difference between Hinayāna and Mahāyāna was that the former sought emancipation through the

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Mahāyāna

realization of the absence of individuality (*pudgala-sūnyatā*) in the constituents forming a being; in other words, they would not distinguish a man from an animal so far as the five constituents were concerned. The Hīnayānists admitted the existence of the constituents but only in a fleeting form. The Mahāyānists, on the other hand, while admitting the importance of realization of *pudgala-sūnyatā*, added that there must also be the realization of the non-existence of worldly beings and objects in reality (*dharma-sūnyatā*). Without insight into *dharma-sūnyatā*, they contended, there could be no realization of the Truth. So, the fundamental difference between Hīnayāna and Mahāyāna was the latter's denial of the real existence of matter, the fleeting existence of which was admitted by the Hīnayānists.

Extreme altruism is one of the features of the Mahāyāna system : a Mahāyānist seeks the happiness and emancipation of others before his own. With this objective the following practices are prescribed :

(1) Development of *Bodhicitta*. In order to attain perfect knowledge (*bodhi*), a Bodhisattva must at the outset take the vow that he would dedicate his life to the service of others.

(2) Perfection in *Pāramitās* or the highest virtues. There are six *Pāramitās*, viz., charity, observance of moral precepts, forbearance, indomitable energy, meditational exercises, and acquisition of the highest knowledge, i.e., realization of *dharma-sūnyatā*. By *Pāramitā* it is meant that a Bodhisattva must not hesitate to sacrifice his life, not to speak of his material and spiritual possessions, in order to attain perfection in the six virtues mentioned above.

Since the goal of the Mahāyānists was Buddhahood, they increased the Hīnayānic stages of spiritual progress to ten, adding two more as extra acquisitions in order to reach the state of Buddha. The Mahāyānists took up as their ideal the whole life of Gautama Buddha, as also his previous existences when he had been designated as a Bodhisattva. In those existences Gautama Buddha had fulfilled all the *Pāramitās*, involving extreme forms of self-sacrifice. The Hīnayānists regarded the achievements of Gautama Buddha as rare and supernormal and not meant for the generality of his followers. They sought their own emancipation first and aimed only at *Nibbāna*, not Buddhahood. For these reasons they were regarded by the Mahāyānists as selfish and inferior.

Mahāyānist monks observed all the disciplinary rules and practised the meditational exercises of the Hīnayānists, but they laid stress on self-dedication to the service of others. Their extreme

altruism gave a strong impetus to the missionary spirit of the time. Mahāyāna gave wide currency to the belief that the installation and worship of Buddha and Bodhisattva images, and the erection of *stūpas* conferred great merit; this led to the rapid development of art, architecture and sculpture in the post-Christian era.

There were two schools of thought in Mahāyāna: the Mādhyamika propounded by Nāgārjuna of Vidarbha, and the Yogācāra propounded by Asaṅga of Peshawar. Of the two, the former was dialectical and more negativistic; it would not give any attribute to *Nirvāṇa*, while the other described *Nirvāṇa* as pure consciousness, which has no relation with the consciousness of a being. Each school of thought had a number of distinguished exponents—Āryadeva, Vasubandhu, Dinnāga, Dharmakīrti and others.

During the Gupta period the Buddhists were apparently not looked upon with disfavour by the rulers who were remarkably enlightened and tolerant. A marked reorientation of Buddhist art, architecture and sculpture took place in this age. Towards the end of the sixth century A. D. the Gupta Empire began to disintegrate and many petty kingdoms arose. Three of the new ruling dynasties, the Maitrakas, Maukharis and Vākātakas, gave their patronage to Buddhism, even though they were worshippers of the Sun or of Śiva.

Harṣavardhana was a strong supporter of Mahāyāna teachings and made lavish gifts to Buddhist establishments. He himself, it is on record, washed Buddha images to earn merit. Along with king Bhāskaravarman of Assam and eighteen other rulers, he attended the religious assemblies of monks, summoned at Kanauj and Prayāg. These assemblies were attended also by non-Buddhists, including Brahmins. While Harṣa extended his favour to Buddhist monks he offered gifts to non-Buddhists as well.

About a century passed between the death of Harṣavardhana (647 A. D.) and the advent of the Pāla dynasty (765 A. D.). In this period Northern India was divided into a number of petty, independent kingdoms. Buddhism maintained its existence at its various centres. Dharmakīrti, the great logician, lived in this age. After him there came several monk scholars of distinction but they were not of the same calibre. Buddhism, as the account of Hiuen Tsang proves, was now losing its hold on the people. The accounts of I-tsing (671-695 A. D.), Huei-Chao (726-729 A. D.) and Ou-K'ong (751-790 A. D.) further reveal that declining state. Pāla rulers (some of whom were worshippers of Śiva and Viṣṇu) became strong supporters of Buddhism, but the religion developed at this time a new phase known as Tāntricism.

The Tāntrik Buddhists, divided into two schools of philosophy, Mādhyamika and Yogācāra, held Mahāyāna doctrines, but their method of realizing the Truth was quite different from that of the Hīnayāna or the Mahāyāna. Essentially an esoteric faith, Tāntricism prescribed five gradual steps for spiritual culture : rites and ceremonies; meditational practices for external and internal purity; finger-gestures and physical postures; utterance of spells; and higher types of meditation or Yoga. It regarded the human body as a microcosm containing the lowest and the highest forms of conceivable worldly forces; by the above five means it could be transformed into a divine state. Meditation was the most important of those means. By meditation the Tāntriks made the mind-force rise to the centre of the eyebrows, along three nerves in the backbone (cerebro-spinal axis). When the mind-force reached the eyebrows, the meditator realized the truth of the oneness of worldly forces.

The bane of Tāntricism was its conception of worldly forces, among which were wine, fish, meat and sexual enjoyment. An adept was given the liberty to enjoy these four while meditating with the physical postures and finger poses, but there was the strict injunction that his mind was to remain unaffected. Many adepts, however, lost themselves in the temptations. They debased the faith and drew upon it the sharp criticism of non-Tāntriks. At the same time there was no dearth of Tāntrik saints, whose sanctity and erudition fascinated the people not only of Northern India but also of Tibet, China, Mongolia and Central Asia. The line of Indian Tāntrik Ācāryas began with Saraha and continued with Lui-pā, Kambala, Lalitavajra, Padmavajra, Indrabhūti and several others, most of whom composed learned philosophical treatises on Tāntricism. This new phase of Buddhism captured the imagination of the people of Bengal, Orissa, Sikkim, Bhutān and Tibet. The Pāla rulers became devotees of the Tāntrik Ācāryas and gave their patronage to Buddhist temples and monasteries.

There were many Buddhists in Orissa in the 15th and 16th centuries, but their faith had undergone many modifications and could hardly be called Buddhism. Here, as also in Bengal, slowly the religion got mixed with Hinduism and with local cults and beliefs. Its existence could be traced only in the names of a few deities, certain ceremonies, ethical rules, and a concept which had some affinity with the *Śūnyatā* of the Mahāyānists. In its latest form Buddhism represented the transitional stage through which it merged into Hinduism and lost its identity altogether.

It is saddening that a great religious and cultural movement like Buddhism, which had a long and glorious history in India and

which disseminated Indian culture and thought in Central and Eastern Asia should have almost disappeared from this country. Even its vast literature has disappeared from India, leaving no trace. The decline of the religion was due not so much to external causes as to its internal make-up. Buddhism was originally a non-Brahminic, if not anti-Brahminic, movement. It challenged the ancient social and religious systems and beliefs, and for that reason it could not win the support of the masses. Buddhism in India was not a full-fledged religion, as it did not make any provision for the laity. It was meant only for recluses who would give up their household life and live in monasteries as monks and nuns. It did not provide for rituals and ceremonies, so indispensable for the laity. It did not insist upon an exclusive lay society of its own. On the other hand, it permitted its lay devotees to follow their own social customs and ceremonies, unless those interfered with its ethical principles. The monks were directed to remain aloof from the ceremonial affairs of householders. The lack of close collaboration between the monks and the laity made it easy for the laity to revert to the age-old Hindu social and religious systems.

When Mahāyānism yielded place to Tāntricism, there came about a slight revival of the religion. That was due to the extraordinary power of the Tāntric saints—who made use of spells and charms. Tāntricism succumbed to the externals of its practices. Further, it may be noted that Tāntricism is essentially a form of *sādhanā* common to all religions. In the meditational aspect there was no difference between Hindu and Buddhist Tāntricism. The two systems differed in the deities invoked e.g., the Buddha and Tārā in Buddhism, Śiva and Śakti in Hinduism. Gradually, the two systems coalesced by identifying the Buddha with Śiva and Tārā with Kāli. Minor deities of the Buddhists like Dharma Thākura were adopted by the Hindus for worship. In this way the fusion of the two religions brought to an end Buddhism as a separate entity. Finally, Muslim invaders who mistook the monasteries as forts and shelters for enemy forces burnt down the structures with their stocks of precious manuscripts. Thus ended a religion which had made spiritual culture its main pivot, held up a very high ideal of self-abnegation, and propounded a deep, abstruse philosophy unintelligible to the masses of the people.

The only place in Bengal where Buddhism lingered was the Chittagong District, now in East Pākistān. There, the Tāntric saint-scholar Tilo-pā lived in a monastery called Pandita Vihāra. Excavations have yielded many images of Buddhist gods and

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goddesses, proving that the Buddhists of Chittagong were Mahāyānists or Tāntricists. The Buddhists of Chittagong also would have become Hindus, had not the spiritual preceptor of the king of Burma, Bhikkhu Saṅgharāja, visited the place in the latter part of the 19th century and revived the ancient faith. But he imposed Theravāda Buddhism of Burma on the Bengal Buddhists. It was at his instance that young novices from Chittagong were taken to Burma and given proper education in Pāli scriptures. In course of time the *Śramaṇas* and *Bhikṣus* of Chittagong also went to Ceylon for similar studies. With this revival a lay community grew up, a section of which along with a few monks have come over to the Indian Union and settled here. They have formed in Calcutta the Bengal Buddhist Association, through which they try to reach the cultured classes of West Bengal. This Association also looks after Buddhist temples in Calcutta, Darjeeling and other places. According to the Census of 1961 the number of Buddhists in the Indian Union including Sikkim is 3,256,036. The Buddhists of Assam also have an Association through which they bring together the Buddhists scattered all over the State.

In Sikkim and Bhutān the prevailing religion is Tāntric Buddhism of the Kar-gyu-pā sect founded by Padmasambhava, who is regarded by the people as the second Buddha. There are also followers of the Ge-lug-pā sect founded by Tsong-kha-pā.

In the past decades there has been some revival of Buddhism in India. The work of the Mahābodhi Society has been notable. This Society was established in Calcutta by Anagarika Dharmapala of Ceylon who dedicated himself to the resuscitation of the lost faith in India. The Society has several branches in this country. In Delhi there are three Buddhist temples and the most prominent of them is in charge of the Mahābodhi Society. The Buddhist temples and monasteries at Buddha Gaya, Sārnāth, Kusinagara and Sānchi are well known. At Ajmer, members of Scheduled Castes who have embraced this faith have started the Mahābodhi Aśoka Mission. There is a South Indian Buddhist Association with its centre in Madras.

### 3. Jainism

Vardhamāna Mahāvīra Tīrthankara, the chief protagonist of Jainism, is reputed to have been a relative of king Bimbisāra. He started his religious life as a reformer of an ancient order, traditionally founded by R̥śabha and Pārvanātha. Like the Buddha

he belonged to the Licchavi clan. When about forty years of age he started his individual teaching, travelling widely and organizing a new religious order which comprised monks, nuns and lay brethren and sisters. Like the Buddha, again, he did not seek to break the framework of Hindu society, although even more than the Buddha he opposed the practice of *Yajña* or sacrifice. Mahāvīra recognized the existence of Hindu gods like Indra and Brahmā. Jains reject the doctrine of Ātman and Paramātman, as developed in the *Vedānta*. Believing that minerals and plants no less than animals possess *Jiva* (life), they stress the doctrine of *Ahimsā*, non-injury, and denounce the infliction of pain. They do not profess belief in a creator of the world and regard God only as the most complete manifestation of the powers latent in man. Jain teaching has been summed up in these words: "Do your duty and do it as humanly as possible." Non-killing must not interfere with one's duties. The King or the Judge, for instance, has to hang a murderer.

Jainism cannot be regarded simply as a reaction or breakaway from the Vedic religion. Jains believe that their system is the eternal truth revealed in every era by successive Tirthankaras or Jinas. Dr. Radhakrishnan has pointed out in his *Indian Philosophy* that the *Yajur Veda* mentions the names of three Tirthankaras, namely, Rṣabha, Ajitanātha and Ariṣṭanemi.

Jainism accepts the existence of an eternal, non-material soul which persists through all changes and migrates from one body to another until finally liberated. It lays stress both on external and internal self-denial, while the Buddha was opposed to external austerities, which he regarded as useless. The word *Nirgrantha*, meaning free from all fetters, internal and external, is used in Jainism as a synonym for the liberated soul. Jinas or Tirthankaras are said to have attained perfection by their own efforts in this very universe. Jainism is totally opposed to offering devotion to any Being, human or divine, in the hope of gaining bliss or immortality. Mahāvīra declared: "Man, thou art thine own friend. Why wishest thou for a friend beyond thyself? One must fight one's enemies with faith in one's own strength. The true victor is expected to defeat his passions and cravings, and not his fellow beings. Fight with yourself—why fight with external foes?" Thus, in this system, man attains perfection through self-help.

The Jain conception makes worship of God absolutely impersonal. All human souls are dealt with without distinctions of colour, caste and country. The Jain *Navakāra Mantra* pays homage not to individuals but to five classes of *Parameśthins* or evolved

souls. The Jain system also believes in realism and holds the existence of all objects to be real.

The early Digambara Jains, or at least some among their rigid order of ascetics, went about bare and unclothed. The Śvetāmbaras wore white garments. However, there were few doctrinal differences between the two sects. The Digambaras assigned an inferior status to women, especially in respect of monasticism. According to both the systems, the animate and inanimate universe arise from the interplay of atoms without a creator or ruling providence. All Jains believe in *Karma*; and *Mokṣa*, according to them, is the deliverance of the soul from the fetters of *Karma*. After deliverance one becomes an *Arhat* or *Jina*. The Jains believe in the eternity of matter and in the doctrine that the soul attains final relief from bodily sufferings through disengagement from good and evil. The laity among the Jains are called *Śrāvakas*, women Jains being *Śrāvikās*. Monks are known as *Yatis* or *Munis*. The term *Brāhmaṇa* is also used by them, as by the early Buddhists. The terms *Arhat*, *Jainaśvara* and *Tīrthaṅkara* are used for the liberated person, and homage is paid to 24 Tīrthaṅkaras beginning with Ṛṣabha or Vṛṣabha and including Neminātha, Pārśvanātha and finally Vardhamāna Mahāvīra, the last of the sages. Mahāvīra relinquished his divine status and was incarnated. All passions subdued, he attained divine knowledge in Pāwapuri an ancient city near Patna and then inaugurated the present system of religious and secular practices among the Jains.

It may be noted that the Jains are today found in large numbers in several parts of Northern India and also in Mysore and Bombay and elsewhere in the South. They form an important commercial community and have been responsible for many acts of charity and beneficence. Their temples, in which the Arhats or Tīrthaṅkaras are adored, often possess great architectural beauty; the Dilwāra Rānakpur and other temples in and near Mount Abu, the Girnār temple near Junagadh and the Pārśvanāth and Pāwapuri shrines are good examples. The Jains collect large sums of money as donation, and these are used not only for the renovation and maintenance of their temples but for conducting institutions for the teaching of their philosophy, for poor relief, and for general and spiritual education and for veterinary treatment.

The Jains have developed a remarkable system of psychology and philosophy embodying the doctrine of relativity. Their Jain doctrines Syādvāda aims at harmonizing seemingly discordant doctrines. It furnishes a remarkable example of toleration, and intellectual freedom. The Jains

declare that no one has the right to claim that he alone is in the right. This is called Anekāntavāda.

*Tirtha* means ford and *Tīrthāṅkara* is a spiritual guide or philosopher who enables one to cross the ocean of recurring births. The Jain doctrines claim that there have been various cycles and that the twenty-four Tīrthāṅkaras have preached the eternal doctrine.

The word *Jain* is properly written as *Jīna* or conqueror : the conquest of passions which are regarded as enemies of the soul is a main essential of the faith. Jain doctrines are summed up in *Ahīṃsā paramo dharmaḥ*—non-injury to living beings is the highest religion. Because of this maxim the Jains are vegetarians. The more strict followers of the teaching even avoid root vegetables, such as potatoes.

While demanding severe self-control Jainism approves suicide in certain circumstances. According to Jain metaphysics, souls are infinite and each soul is an individual: that is, it is not part of the *Pāramātman*, universal soul. Each retains its individuality during its entire existence. What differentiates the soul from all other substance is *Cetanā*, consciousness. The universe, which is without a creator, has no beginning and no end. Jainism believes in rebirth; the theory is that we are souls combined in a subtle way with matter, gross and fine; by getting rid of this foreign element, we reach a condition of knowledge and blissfulness; and it is only by mental and moral discipline that this condition can be attained.

The aim of the Jain religion is the attainment of *Mokṣa*, salvation, which means freedom for ever from an endless circle of births and deaths in the various forms of gods, human beings, animals or infernal beings. This freedom is gained through one's own steady and strenuous striving along the path of right vision or faith, right knowledge and right conduct.

The doctrine of Karma is at the foundation of the Jain concept of ethics and epistemology, *Karma* being regarded as a mere series of acts and effects. Jain philosophers hold that every soul possesses the faculty of infinite comprehension, infinite energy and infinite bliss. Though the soul is pure and perfect by nature, it is subject to limitation and impurity. As the light of the Sun and the Moon is obscured by a cloud of dust, so is the soul subject to obscuration. Jain psychology has carefully analysed sensory and extra-sensory perception and admits the possibility of clairvoyance, telepathy, and omniscience, which result from the entire annihilation of all obscuring Kārmic impediments.

Jain philosophy also stresses the reality of the Universe and

the relativity of judgment. Any object that is real has three fundamental characteristics—origination, decay and permanence. Every object that seems to be permanent is liable to origination and decay. Everything that seems to originate and perish has an aspect of permanency. This doctrine has been stated by Mahāvīra: "Thus from one point of view the soul is permanent. From another point of view the soul is not permanent. From the viewpoint of substance the soul is permanent." In other words, any particular object can be seen from different points of view.

The principle underlying Syādvāda makes Jain thinkers catholic in their outlook. The only thing they dislike in other philosophers is their dogmatic claim that they alone are right, a claim that amounts to a fallacy of exclusive predication (Ekāntavāda). Against such a fallacy of philosophical speculation a protest has been raised recently in America by the Neo-realists, who have called it the fallacy of exclusive particularity. But no Western or Eastern philosopher has so earnestly tried to avoid this error as the Jains have done.

#### 4. Zoroastrianism

In the palmy days of the old Persian Empire, Zoroastrianism was the dominant religion in West Asia and in the form of Mithra-

ism it spread over vast areas of the Roman Empire

\*Mazdayasnism even as far as Britain. The term Zoroastrianism has come to be popularly used by Western scholars as derived from Zoroaster, the Greek form of the original name Zarathushtra, the great Prophet of Irān. The term is misleading though. Just as the Muslims call their religion Islām, and not Mohamedanism, so too the Zoroastrians wish their religion to be known as Mazdayasnism, which implies the worship of Ahura Mazdā, "the one and only God." Zoroastrianism is popularly identified with Fire-worship. This also is misleading: Fire is worshipped only as the symbol of Ahura Mazdā, since it has the characteristics of brightness and purity.

It is still a disputed question when exactly Zoroaster was born. Western scholars like Professor A. W. Jackson and Dr.

Avesta and Vedas E. W. West place his birth at 660 to 583 b. c. This is palpably much too recent as even Pliny of ancient Rome believed that Zoroaster lived five thousand years before the death of Plato. Again, in view of the close

\*Pārsis speak of their religion as Mazdayasni religion. As such, the term Mazdayasnism is used in preference to Mazdaism.

relationship between the Vedas of the Hindus and the *Gāthās* of Zoroaster, the date of Zoroaster may well be placed at about five thousand years before Christ, because the Vedas themselves have been placed by some scholars at an earlier period\*. Vedic Hinduism and Zoroastrianism bear the same relationship as Judaism to Christianity. It is an accepted fact that the Aryans were not indigenous to India, but had invaded India in the hoary past. The reason for this invasion may have been economic, for the fertile plains of India have always attracted foreign conquerors. But it is equally likely that there had been some sort of religious schism between the Irānian Aryans of Central Asia and the Aryans who settled down in India. The sacred books of both seem to point at this conjecture. The Vedic gods like Indra, Mitra and Agni figure in the Irānian pantheon also. There is a marked similarity between Sanskrit words and Avestaic as exemplified below:

<i>Sanskrit</i>	<i>Avesta</i>
<i>Veda</i> (knowledge)	<i>A—vista</i> (knowledge)
<i>Soma</i> (an intoxicant drink)	<i>Homa</i> (same as Soma)
<i>Yajña</i> (sacrifice)	<i>Yasna</i> (worship, prayer)
<i>Gitā</i> (song)	<i>Gāthā</i> (song)
<i>Atharvan</i> (fire priest)	<i>Athravan</i> (fire priest)

It is interesting to note that the *Soma* drink of the Vedic Aryans had its Irānian counterpart in *Homa*. Even more interesting is the fact that in the later Vedas, *Asuras* came to mean Demons and *Devas* celestial spirits. But in the Avesta *Deva* is invariably identified with Demon, and *Ahura* stands for the Almighty God. This itself marks a revolutionary departure from the old Vedic traditions and this departure perhaps started when Zoroaster began preaching against the worship of idols and equally against sacrifices. In *Yasna* XXXII. 12 and 14 Zoroaster speaks out against those who "destroy the life of the ox with shouts of joy." As Markham has noted, "Persia is the only one (nation) that has never in any period of history worshipped graven images of any kind." In short, Zoroaster may be said to have introduced revolutionary reforms by inculcating monotheism and high moral life as against idol worship and overemphasis on ritual sacrifice. This seems evident in the diatribes against *karpans* and *kavis* in

\*The age of the *Rg-Veda* is a much disputed point. Many scholars, both Indian and European, are inclined to put the date of the Vedas at about 2000 B.C. But Jacobi was inclined on astronomical grounds to push back the antiquity of the Vedas to 4500 B.C. and Bal Gangadhar Tilak to 6000 B.C. The present writer is inclined to accept the latter view and has placed Zoroaster at 5000 B.C.

(This view runs counter to the widely accepted chronological scheme—Editor.)

the *Gāthās*. The word *karpan* is connected by scholars with the Sanskrit word *kalpa*, meaning religious ritual. Thus *karpan* seems to mean one devoted to rites and ceremonies with the implication of magic. *Kavi* not only meant a poet but was applied to priests, and in that sense it drew invectives from Zoroaster. The *Gāthās* of Zoroaster, the only writings ascribed to him, give a vivid picture of his mission and of the society of his time.

The pre-Zoroastrian religion of ancient Irān was undoubtedly that of nature worship, which involved the worship of the elements like Fire, Water and Earth. It may be surmised that the religion of the Vedas was also the religion of the ancient Irānians. The reforms introduced by Zoroaster marked a departure from the old nature worship of Vedic religion. In his *Gāthās* he uses terms of reverence for the elements of nature but does not advocate any direct worship of them, and looks upon them only as symbols of the might and glory of Ahura Mazdā. However, the priests, deeply merged in the old traditions of nature worship, fell back upon them after the time of Zoroaster. The daily prayers of the Pārsis even today exalt Fire, Water, Earth, Sun and Moon, but beyond this exaltation there is the recognition of Ahura Mazdā as the only God; and thus even post-Zoroastrianism bears the impress of Zoroaster. During the decadence of Zoroastrianism, books like the *Vendīdād* became popular and are considered sacred even today.

The *Gāthās* are five in number : *Ahunavaiti*, *Ushtavaiti*, *Spenta-Mainyu*, *Vohu-Khshathra* and *Vahishtā-Ishti*. The first four are ethical and philosophical, developing the omnipotence of Ahura Mazdā and dealing with the problem of evil as due to the activities of *Angra-Mainyu*. The fifth *Gāthā* is a hymn on the occasion of his daughter's marriage. Zoroaster develops the idea of *Behest* (Paradise) as the reward after death for the good and hell for the evil. The *Gāthās* are written in Avesta which closely resembles Vedic Sanskrit.

After Zoroaster's time, the ethical dualism he developed came to be interpreted as metaphysical and the *Vendīdād* practically speaks of two Creators, one of good things and the other of evil. Alexander the Great's invasion of Irān led to the destruction of Zoroastrian books and gave a set-back to Zoroastrianism, but it survived in a decadent form till the time of Ardashir Papekhān, the founder of the Sassanian dynasty. Then a revival came through a collection of the remnants of old scriptures and its effects lasted until the Arab invasion of Irān. With the defeat of Yazdezerd, the last Sassanian king, Irān passed into Arab hands and Islām became the dominant religion. According to the

Persian system of historical chronology, the reign of an Irānian king marked an era by itself. Thus the last era of Zoroastrian history is connected with the name of Yazdezerd, and hence the paradox that the Zoroastrians even today continue the Yazdezerd era which is 1333 in the current year (1964 A.D.).

The old connection between Hinduism and Zoroastrianism revived centuries later. After the Muslim conquest of Irān, a few intrepid Zoroastrians left their motherland Pārsis in India and sought refuge in India. The first batch of Irānians is said to have reached Diu about 766 A. D. ; but they abandoned it, set out for another place of residence, and found refuge on the hospitable soil of Sanjān in Gujarāt, then ruled by Jādav Rāna of Sanjān (785 A. D.). During their voyage from Diu, it is said, they were overtaken by a storm ; and they took a vow that if they landed safely they would establish an *Ātash Behrām*, the most sacred fire temple. The vow was fulfilled when the *Irānshāh* was consecrated. After the Muslim conquest of Gujarāt, the fire was taken to Mount Bhārhut (1490), then to Bānsda and Navsāri, and ultimately to Udvādā. The *Irānshāh* in Udvādā is still looked upon as the most sacred temple of the Pārsis. The Zoroastrian immigrants to India are said to have come from Pārs and so they are known as Pārsis. It is possible that a few Zoroastrians were absorbed in the teeming millions of Hindus, but most of them preserved their separate identity. The Pārsis were inevitably influenced by Hindu customs and adopted some Hindu rituals. In the 19th century reformists like Dadabhai Naoroji, Sorabji Bengali, Naoroji Fardoonji and K. R. Cama made a vigorous attempt to restore Zoroastrianism to its old purity.

The main contribution of Zoroastrianism may be said to have been twofold : its ethics and its philosophy. It does not advocate asceticism or celibacy. Polygamy is allowed. The Ethics of Mazdayasnlsm *Vendidād* brings out the Zoroastrian anti-asceticism very forcibly :

“Verily I say it unto thee, O Spitama Zarathushtra, the man who has a wife is far above him who lives in continence ; he who keeps a house is far above him who has none ; he who has children is far above the childless man ; he who has riches is far above him who has none.”

Zoroastrianism advocates no fasts. Liquor is used even in religious ceremonies. The essence of its ethics can be well summarized in three words: *Humata* (good thoughts), *Hūkhta* (good words) and *Huvartshta* (good deeds). *Dinkart*, a sacred book of the Zoroastrians, says : “When men love and help one another to

the best of their power, they derive the greatest pleasure." This injunction constitutes the basis for charity.

*Ardaviraf-Nameh*, which gives a graphic account of heaven and hell in the style of Dante's *Divina Comedia*, says : "There is only one path and it is the path of Righteousness." The main emphasis is on the observance of purity. The *Vendidād* says: "Purity is for men, next to life, the greatest good; that purity, O Zarathushtra, that is in the religion of Mazdā for him who cleanses his own self with good actions, words and thoughts."

The *Gāthās* of Zoroaster present the picture of a state of society in which agriculture had come to be looked upon with loving devotion. It is closely linked with flocks and herds of domestic animals. That explains the reverence for the cow, as evident in the sacred prayer, *Behrām*

Ceremonies and customs  
*Yesht* : "strength to the cow, benedictions to the cow, sweet words for the cow, covering for the cow." This brings out another close affinity between Zoroastrianism and the Hindu reverence for the cow. The influence of Hindu customs is apparent in the Pārsī marriage ceremony which includes recitation of prayers even in Sanskrit, apart from Avesta. There is also the sacred thread ceremony as among Hindus ; not only boys but girls also pass through this ceremony which usually takes place before the age of puberty. This marks the admission of a Pārsī into the Zoroastrian faith. One peculiarly Pārsī custom is the disposal of the dead. In India there are Dokhmas, known as Towers of Silence. They are round structures with a well in the middle and on the sides there are three rows meant for adults and children. The bodies are exposed, devoid of any dress, and are soon consumed by vultures. The practice has been defended on the ground that, according to Zoroastrian principles, neither fire nor earth should be defiled, and also on the ground that this is a way of very quick disposal. The practice seems to go back to the old Irānian custom of exposing the dead on mountain tops. The dead body, before it is removed to the Tower of Silence, is shown to a dog. In ancient Irān, after the flesh had been consumed, the bones were collected and the best guide for that purpose would be a dog. While orthodox Pārsīs are very keen on the disposal of the dead by exposure, there are a few Pārsīs who feel that this custom should be abolished. They feel that electric cremation solves the question of quick disposal. Further, in places where vultures are not available, exposure of the dead means slow unhygienic decomposition. In a city like Bombay, the custom has somehow worked and has gained sanctity in the eyes of the orthodox.

Zoroastrianism has often been identified with dualism between the spirit of goodness and the spirit of evil. There is no problem so difficult to solve as the problem of evil and the answer of Zoroaster is the first attempt in human history to solve this problem. In later Zoroastrianism especially in the *Vendidād*, this dualism is made to cover the whole universe : everything that exists is either the creation of the spirit of goodness, *Spenta-Mainyu*, or of the spirit of evil, *Angra-Mainyu*. Metaphysically this is an untenable position ; in the economy of nature nothing is really useless or absolutely evil. Each plant, each animal, each insect has its own use and fulfils some necessary function in nature. The dualism that Zoroaster preaches in his *Gāthās* was not really metaphysical but ethical. What he wanted to emphasize is the difference between human actions motivated by goodness and those motivated by evil. Purity in thoughts, words and deeds implies the will to do good, to make men better fitted to contribute to the happiness of human society. Anything that is not guided by this motive is apt to lapse into evil. That is the sum and substance of Zoroastrian dualism.

Attempts have been made by some Christian authors to look upon this dualism as a negation of monotheism. Some Pārsī scholars have said that dualism in Zoroastrianism is not ultimate. That only shows the inability of non-Pārsī and even of Pārsī scholars to understand the significance of this aspect. In any monotheism which looks upon God as good, the problem of evil looms large, because the question inevitably arises : if God is good, why has He created evil? To save the goodness of God, evil is ascribed to another entity opposed to God. No monotheism is really free from this. Christianity, apart from the theological difficulties of the Doctrine of Trinity, has to recognize the power of Satan who becomes almost identical with the Zoroastrian *Angra-Mainyu*. Likewise, Islām, which is as monotheistic as any religion can be, recognizes the power of Iblis. Neither *Angra-Mainyu* nor Satan nor Iblis is really a power in itself. Each represents only the tendency in the human soul to deviate from the path of righteousness. No one recognizes this more clearly than one of the greatest Christians of our times, Dr. Albert Schweitzer, who does not fight shy of the idea of dualism with reference to Christianity. "Every rational faith," he says, "has to choose between two things; either to be an ethical religion or to be a religion that explains the world. We Christians choose the former as that which is of higher value." Thus dualism in highest monotheisms is only ethical. He who wills good wills according to the will of

God ; he who wills evil negates the will of God and may be said, metaphorically speaking, to be following the spirit of evil. Zoroastrianism may well claim the credit of having offered a solution of the problem of evil, which has its advocates even in the 20th century, as in the philosophy of William James.

From the doctrine of dualism Zoroastrianism develops its eschatology. In fact Zoroaster may well claim to have been almost the first to speak of the immortality of the soul. Eschatology Physical death is inevitable, but that does not mean the death of the soul. The souls of the good go to Paradise and the souls of the evil-doers go to Hell. That is the belief taken up from the Persians by the Jews, during their Babylonian captivity, and it has been accepted by millions of Christians and Muslims. Zoroastrian literature is particularly rich in dealing with immortality. *Dadistan-i-Dinik*, *Mino-Kherad* and *Ardaviraf-Nameh* give very graphic descriptions of Heaven and Hell. On the fourth day after death, the soul of the good is met by a beautiful maiden who describes herself as the manifestation of his own good life. The soul of an evil person is met by a hag who describes herself as the manifestation of his or her own evil life.

The number of Zoroastrians the world over is not much more than 130,000. With the exception of some ten thousand in Irān, all of them live in India, the vast majority being concentrated in the city of Bombay. Zoroastrian temples take the form of fire temples and are of three grades—*Ātash Behrāms*, *Agiaris* and *Dādgāhs* in the order of sacredness. There are only eight *Ātash Behrāms*; one in Udvādā, one in Navsāri, two in Surat and four in Bombay city. Of these the oldest, the fire known as *Irānshāh* is in Udvādā; it has been kept blazing for 1,300 years and is unique in that respect. This fire temple is a place of pilgrimage for the Pārsīs. Once the sacred fire is installed in a fire temple, it must always be kept alive.

Among the Zoroastrians of ancient Irān there were three castes, *Āthravans*, *Rathaeshṭārs* and *Vāstryosh* corresponding to the three castes of Aryan Hindus : *Brahmins*, *Kṣatriyas* and *Vaiśyas*. But the division was not as rigid as in later Hinduism. In India, the Pārsīs are divided only into two classes, priests and behdins (laity). The priests used to be very exclusive and intermarriage was seldom permitted. This distinction is now almost gone, but even today only the son of a priest can become a priest.

Another distinction grew in the last two hundred years on the basis of the different ways of calculating the length of the year.

In ancient Irān the length of the year was known to be 365 days and 6 hours. The difference of 6 hours was made up once in 120 years by adding one month, known as *Kabisā*. This system was continued by the Zoroastrians in Irān even after the Arab conquest, but the Pārsīs in India, perhaps due to ignorance, did not observe the *Kabisā*. Having discovered it in the 18th century, some Pārsīs adopted the Irānian calculation and called themselves Kadmis or Kadims, meaning, the ancient; while the Pārsīs who did not wish to change their era came to be known as Shenshāhis. Oddly enough, this difference gave rise to bitter controversy in the 18th century, but later on Pārsīs settled down into the two sects of Kadmis and Shenshāhis. Fire temples are open to both Shenshāhis and Kadmis. There is a slight difference in the prayers of the two sects, introduced artificially to keep up the distinction. The Kadmi new year is one month in advance of the Shenshāhi New Year. Of late Jamshedi Naoroz which falls on 21st March has also come to be recognized as the New Year, though only by a few Pārsīs. There is no doubt that in ancient Irān Jamshedi Naoroz ever since the time of King Jamshed was looked upon as the real New Year, and it has been observed even by the Muslims of Irān. The few Pārsīs who observe the Jamshedi Naoroz as the real New Year have come to be known as the Faslis. Intermarriage among these sects is quite common.

The priestly profession tends to be unpopular, since other walks of life offer more lucrative openings. Attempts have been made to educate the priests in institutions like the Cama Athorman Institute. Even so, the educated priests tend to avoid the priestly profession.

The number of religious festivals observed by the Pārsīs today is comparatively small. The first day of the first month of the Zoroastrian year which actually falls on 21st March as observed by the Shenshāhis now falls in the end of August and the Kadmi New Year falls a month ahead in the beginning of August. The sixth day of the first month is known as Khordad Sāl. It is traditionally the birthday of Zoroaster. The 11th day of the 10th month of the Zoroastrian calendar is the day when Zoroaster died. Jamshedi Naoroz which falls on 21st March is observed by all Pārsīs as a day of rejoicing even though only a few celebrate it as the New Year. The last ten days in the Zoroastrian year are sacred to the dead. The 19th day of the Zoroastrian month, Farvardin is a sacred day when the Pārsīs go to the Tower of Silence and offer prayers in memory of the dead in their families. The days of the month which correspond with the names of the months in Zoroastrian calendar are particularly sacred, e.g., the

day Ādar in the month of Ādar. Each day in a month of 30 days is named after a different Angel. Five days, the first, third, ninth, seventeenth and twentieth, are particularly sacred when Pārsīs are expected to go to a fire temple. The first day of the month bears the name of Ahura Mazdā. The third and the ninth days are sacred to Fire and are named *Ardibehest* and *Ādar*. The seventeenth is sacred to Sarosh and the twentieth sacred to Behrām Yezd. Sarosh and Behrām are particularly helpful to those who invoke their help.

The sense of religion among Pārsīs today very often goes beyond the confines of Zoroastrianism. The Zoroastrians of India have been influenced as much by the teachings of Christ as by the Hindu cults of Sāibābā and others. It is not uncommon to find in Pārsī households picture of Zoroaster and of Christ and of Sāibābā or some other Hindu sage or Muslim Pir. Pārsī faith, however, is still rooted in the personality and teachings of Zoroaster. Quantitatively, Zoroastrianism cannot count for much in the world today. Qualitatively, it has played a great part.

Since the days of the British settlement in Western India beginning with Surat, the Pārsīs have experienced an era of great prosperity. For centuries they had been obscure agriculturists. But even in the days of their obscurity they produced a few eminent men, the most famous of them being Dastūr Meherji Rāna of Navsāri. An eminent scholar, his fame reached the ears of Emperor Akbar. Tradition has it that Akbar with his usual love of religious discussions invited Meherji Rāna to his Court and was so impressed by his exposition of Zoroastrianism that he let himself be invested with the sacred shirt and the sacred thread.

The custom of converting the children of Pārsī fathers by Hindu mothers had continued through centuries. But in the last hundred years the Pārsīs became hostile to the idea of admitting anyone to their faith unless both the parents were Pārsīs or Irānian Zoroastrians. Feelings ran high in the early years of this century and a particular case of conversion had to go to the Bombay High Court. The case was tried by a Pārsī judge and he decided that children of a Pārsī father had the right to be admitted as Zoroastrians, even though the mother was a non-Zoroastrian. In recent years marriages between Pārsīs and non-Pārsīs have become much more common and the old antipathy to admitting children of non-Zoroastrian mothers to the Zoroastrian faith has almost died down.

This brief survey may be closed with an extract from *The Life and Teachings of Zoroaster* by A. R. Wadia :

"During its triumphant career of over two millennia it came into living contact with millions of people both to the east and west of Irān and in this period it transferred a good deal of its moral and spiritual vigour to other people. The Hebrews and the Christians and the Muslims have all drunk deep, consciously or unconsciously, at the founts of Zoroastrianism, and the best of Zoroastrianism lives in the best of other religions. It is perhaps this consciousness that made the conversion from Zoroastrianism to Islām so easy after the Muslim conquest of Persia, and more definitely took away the zeal to spread their faith among others. A flame that has passed on its light to countless other flames must disdain so sordid a feeling as jealousy. Good thoughts, good words and good deeds are not the monopoly of Zoroastrians. In the dim antiquity Zoroaster preached it, and his reward is that it has become the common inheritance of all humanity."

### 5. *Islām*

Islām was first introduced into India by Arab traders, who gradually established their settlements on the western and eastern coasts of South India, and obtained permission to practise their religion. Sind was conquered by the Arabs early in the eighth century, and North-west Punjab by the Turks in the eleventh. Shihābu'd-din Ghūrī and his generals overran Northern India, and the Delhi Sultanate was established in 1206 A. D. Within a hundred and fifty years this Sultanate expanded almost to the extreme south. Towards the end of the fourteenth century, it disintegrated into a number of provincial states. In the sixteenth century the Mughals built up an extensive empire, which declined in the eighteenth century and survived in name till the middle of the nineteenth.

The invading armies of the Arabs, the Turks and the Mughals were very small, and there is no record of Muslim immigration on an extensive scale. The larger number of Muslims in India is doubtless due to conversion. This can be most conveniently ascribed to force, and the theory could be supported by quoting the extravagant statements of many Muslim historians. But the probabilities are against it. Force was sometimes used, as by Sikandar (1393-1417 A. D.) in Kashmīr. But Muslims of the ruling class were a small minority. They could not have maintained the administration only on the strength of the army and

they could have obtained no co-operation from the Hindu population if they had followed systematically a policy of conversion by force. More than seventy-five years after Delhi had become the seat of a Muslim government, a Sultan complained that the Hindus took out processions, beating drums and blowing trumpets, under the very walls of his palace, to worship their idols on the banks of the Yamuna, and he could do nothing about it. The mighty 'Alā'u'd-dīn Khiljī sought the co-operation of the Hindu capitalists in the execution of his economic policy. Conversions must have been due mainly to other reasons than the use of brute force. In the towns, the acceptance of Islām must have offered advantages to people who were considered outcastes because of their trade or profession, such as weavers, dyers, blacksmiths and barbers, and to those who wished to get service under the government as petty officers, and who would in any case lose their caste if they took up such service. Many large scale conversions are attributed to missionaries, but the accounts are seldom reliable.

The establishment of Muslim government at any place was invariably followed by the construction of a mosque, where the 'Khuṭbā' was read in the name of the ruler by the *Imām* leading the Friday prayers, and by the foundation of a *madrasah* for religious instruction. This formed a nucleus for further religious and social activities. Lahore became such a centre soon after its acquisition by Mahmūd of Ghaznī in 1022 A. D., and a famous ṣūfī, Shaikh 'Alī Hujwairī, spent his last years there and wrote his '*Kashf al-Mahjūb*', the first Persian book on ṣūfism and the ṣūfis. Multān, Uch, Badaun in Uttar Pradesh, Delhi, Ajmer and Nagor also became centres of this kind. Their number multiplied in course of time, and the entire territory under Muslim rule was gradually covered with them.

There are different methods of approach to Islām, as to every other religion. Literally, "Islām" means submission to, or acceptance of the will of God. Its universal quality is expressed in the belief that it is the eternal religion, continuously revealed through Prophets sent by God to all the peoples of the earth, and that it has attained its final and perfect form in the teachings of the *Qurān* and the *Sunnah* of the Prophet Muhammad. Its basic doctrines are a few and simple. There is one God, omniscient, omnipotent, the creator of the universe, of time and space, whose law governs all that exists. The *Qurān* is the Word of God, revealed to His messenger, the Prophet Muhammad, in order to lead mankind on the right path. The simplicity of doctrine is enshrined in the *Kalimah* or profession of the faith; "There is no god but *Allah*; Muhammad is

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the Prophet of *Allah*." The Muslim has to believe that there will come the Last Day when God will judge all mankind, and give to each person the reward and the punishment due to him according to his actions. The basic commands of Islām are prayer, fasting, pilgrimage to Mecca, performance of all that is enjoined and abstinence from what is forbidden, and *Jihād*, or striving in the way of God with all the resources at one's disposal\*. The social precepts of Islām include the observance of the principles of equality and brotherhood among Muslims, of generosity and charity towards those in need, and of earning one's livelihood through personal labour. Exploitation, hoarding and profiteering are condemned and trust in God inculcated. The totality of beliefs and practices is called the Shari'ah (path) of Islām.

Islām was propagated within the historical period. There are no doubts about the real text of the *Qurān* or about the basic doctrines. But after the death of the Prophet, when Shari'ah the community rapidly increased in number, situations were created and questions of law arose for which the *Qurān* and the *Sunnah* (the acts and sayings of the Prophet in fulfilment, interpretation or elucidation of what was revealed in the *Qurān*) did not provide an explicit or an adequate answer. Therefore, side by side with the study of the *Qurān* and the patient collection and examination of the decisions and the opinions attributed to the Prophet ('*Hadīth*') a jurisprudence (*fiqh*) was developed through the exercise of intelligence (*ijtihād*), the use of analogy (*qiyās*) and the consensus of the learned (*ijmā'*) in the interpretation of the *Qurān* and the *Sunnah*. The practices and customs of a people ('*urf*), provided they were not inconsistent with the *Qurān* and the *Sunnah*, were also recognized as valid. Some jurists had recourse to the principle of adopting the view which appeared preferable (*istihsān*) or advisable and be-

\* The Muslim prayers are said five times a day, before sunrise (*fajr*) after mid-day (*Zuhr*) before sunset (*'asr*), after sunset (*maghrib*) and at night (*isha*). These are obligatory, and should preferably be in congregation. Joining the congregation for the midday prayer on Friday is also obligatory. Besides these, supererogatory prayers have been usual among the pious. Zakat is a contribution of  $2\frac{1}{2}\%$  on income or savings from specified types of movable and immovable property, jewellery and cash. The ninth month of the Muslim lunar year, 'Ramadān', is devoted to fasting, which means total abstinence from all food and drink from early dawn till the *maghrib* prayer, well after sunset. To break a fast once undertaken is a serious offence, and must be avoided if at all possible. The pilgrimage, or *haj*, has to be performed on the 9th of *Dhu'l Hīj* the last month of the year, and commemorates the Prophet Abraham's sacrifice. A pilgrimage to Mecca ('*umrah*) can be performed at any time.

"Performance of what is enjoined and abstinence from what is forbidden" is the general principle covering all duties, whether specifically mentioned or not in the *Qurān*. Striving in the way of God, *Jihād*, is also a general principle, meant to ensure that the Muslim dedicates his life to the service of God. War against aggressive enemies of Islām and the Muslims is only one aspect of *Jihād*.

neficial (*istiṣlah*). This did not obtain general recognition among the learned ('*ulamā*). Jurisprudence (*fiqh*) gradually became a comprehensive science which included and co-ordinated all the branches of (religious) knowledge, and was based on the four "roots", *Qurān*, *Sunnah*, *Qiyās* and *Ijmā'*. The differences in the degree of emphasis on the four roots led to the development of four schools of jurisprudence, the Hanafī, the Shafī'i, the Mālikī and the Ḥambalī. By the thirteenth century, when Islām spread in India, those learned in the law had succeeded in imposing the practice of confining study and thought to the existing standard and representative works of the four schools, and regarding the application of *Ijtihād* and *Qiyās* as irregular, if not objectionable. This was called *taqlīd*, and it meant that, in order to be considered orthodox, a Muslim had to follow a particular code of jurisprudence. In India, the vast majority of Muslims have been followers of the Hanafī code, and have called themselves *ahl-i-Sunnah w'al Jamā'ah*, that is, believers in the example of the Prophet and the integrity of the community. Those who did not accept this code have been regarded as non-conformist, unorthodox or heretical, depending on the extent of their disagreement with, or rejection of the code.

The development of Muslim religious law took place under circumstances in which it was both natural and inevitable to presume that Islām would be the religion of the State. Shari'ah and the State This made it essential that the ruler should be responsible for enforcing the Shari'ah; that the Shari'ah should be embodied in a code; that there should be learned men ('*ulamā*) serving the *qādīs* or judicial officers for deciding cases of personal law, of infringement of the Shari'ah, of dispute in regard to correct doctrine and practice, and a system of education to prepare personnel for this service. We cannot examine here the religious policy of the different rulers, but it would not be inaccurate to state that generally the kings derived what advantage they could from the function assigned to them and were not deeply interested in promoting the cause of religion or morality. The law was codified more than once; the *Fatāwa-i-Ālamgīrī* represents the most comprehensive form of the code. Normally, the king had an adviser in matters of religion, called the *Sadr al-Ṣudūr* who was also the chief *qādī*. He made recommendations for the appointment of *qādīs* in the provinces and the town and for the grant of rent-free lands, rewards and charities, controlling in this way the royal patronage of the learned. Sometimes a scholar of eminence who was also renowned for his piety would be given the title of '*Shaikh al-Islām*', but it is not clear whether he possessed any

powers. The religious administration could be violent in self-assertion but was not usually very strict. The *qādīs* seldom earned the respect of the truly religious ; the learned men who sought to acquire influence and authority quarrelled amongst themselves continuously ; and the rulers were too jealous of their power to allow the representatives of religion any independence.

There was no means of controlling opinion except through the secular arm, and the State generally took action if innovation and heresy could be proved to be also subversive of political authority. After the decline of the Mughal empire, the number and power of the Muslim rulers gradually decreased, and with it the official enforcement of the laws of the Shari'ah. Shāh Waliullah (1703-1763 A. D.) expounded ideas which led to a strong movement for the dissemination of religious knowledge and for the reform of manners and customs. He himself translated the *Qurān* into Persian and two of his sons translated it into Urdū. As the British established their dominion, the question arose whether submission to their rule was permissible according to the Shari'ah. Shāh Abdul 'Aziz declared that it was not. Syed Ahmad Shahid, apart from initiating reforms, organized a movement for release from the domination of non-Muslims. Sectarian issues, however, also cropped up. There was conflict on the question of *taqlid*. Dissenters, like the *Fārāizī* sect of Bengal and the *Wahābīs* were as bitterly opposed to the majority as they were to the British government. After the outburst of 1857-58, which had strong religious incentives, the *Wahābīs* continued the opposition. The important fact, however, was that, as the Shari'ah no longer had a secular arm to enforce it, Islām came to mean the beliefs and practices and the political interests of the Muslims as a separate community.

Islām does not permit the division of its believers into worldly and religious men, like the laity and the clergy among the Christians. So there could be no Church and theologians and learned men could not organize themselves on a functional or professional basis. Muslim jurisprudence was the creation of independent scholars who possessed no authority, but only a reputation for learning. The maintenance of the Shari'ah depended on education, and to this considerable attention was devoted. In India, institutions of learning were established immediately after the acquisition of political power, and they kept on multiplying. It is unfortunate that, though their numbers are often mentioned, we find no details in the records about the methods of instruction. The syllabus consisted of standard works on Arabic grammar, jurisprudence, '*Hadīth*' (sayings of the Prophet), *Tafsīr* (commentaries on the *Qurān*), logic, scholastics, Arabic literature and mysticism.

The students were graded according to the books that they were studying. Anyone who had obtained a certificate of having studied all or most of the important texts under one or more teachers of standing could expect employment under the government or himself become a teacher. No great dissatisfaction seems to have been felt with the working of this system, and the syllabus, revised four times in the course of six hundred years, did not change materially; it continued to be taught at Firangī Mahāl, established in the last years of the seventeenth century, in the form of the 'Dars-i-Nizāmī'. The Dār al-'Ulūm, Deoband (1867), shifted the emphasis to theology (*Tafsīr* and '*Hadīth*') while the Dār al-'Ulūm, Nadwah al-'Ulamā (1895) reduced the teaching of the old books on philosophy, scholastics, logic, etc., and added secular subjects. The Bāqiyāt al-Sālehāt at Vellore is a large and important institution teaching theology. The Muslim University of Alīgarh, the Jāmia Osmāniā of Hyderābād and the Jāmia Millia Islāmia in Delhi have attempted a combination of religious and secular instruction. Several institutions, like the Calcutta Madrasah, now known as the Madrasa-i-Āliyah, the Dār al-Muṣannifīn at Azamgarh, the Dā'erah al-Ma'ārif at Hyderābād, and the Institute of Islāmic Studies in Bombay promote and disseminate Islāmic learning.

The position of Islām as the religion of the State involved a rather one-sided interpretation of its doctrine that it was the "religion of nature", which means that it emphasized Sūfism the unity of spiritual and material values and the identity of the secular and the religious life. The tendency to dissociate religion from political and administrative affairs, to concentrate on the personal aspect of religious life and assert ethical and moral values as against legal prescriptions appeared very early among the Muslims. It gradually came to be known as the 'Tariqah' to distinguish it from the Shari'ah and those who followed it were called sūfis. The etymology of this term is uncertain. It may have been derived from *sūf*, wool, from *sūphia*, wisdom, or from *safā*, purity. The sūfis not only evolved an intensely personal approach towards God and the spiritual life but, from the eleventh century onwards, they began to preach among the masses, enrol *murīds* (disciples) in large numbers and establish 'Khanqāhs', or centres of community living. By the end of the twelfth century, when Islām began to spread in India, there were already several *silsilahs* or orders among the sūfis. A *silsilah* or order was a system of spiritual succession, every sūfi who rose to the status of a master (Shaikh or pīr) nominating one principal 'khalifah' (or successor) and as

many 'khalfahs' as he found worthy among his disciples. The orders, Chishtī, Suhrāwardī, Shattārī, Qādirī and Naqshbandī were called orthodox because they insisted on the observance of the Shari'ah. There were unorthodox orders also like the Malamaṭīya and the Qalandarīa, distinguished by some form of extravagance or exaggeration. The Chishtīs and Suhrāwardīs were the first to establish themselves ; their centres were at Ajmer, Delhi Multān and Uch. The Chishtīs adopted most systematically the practice of asking their 'Khalifahs' to go and settle at different places with their *murīds* and form nuclei of truly religious life. Besides the orthodox, there were also unorthodox orders, and ṣūfīs, who did not attach themselves to any order.

The distinctive feature of ṣūfīsm was the spiritual status of the Shaikh. He was believed to possess supernatural power, and to be able to intercede for his *murid* in the grave, when the angles Munkar and Nakīr would interrogate him, and with God finally on the Day of Judgement. It was widely held that a person without a *pīr* would have no one to look after his spiritual welfare in this world and his fate in the next. What impressed the imagination of the masses most, however, were stories of miraculous acts of ṣūfīs, and it is, perhaps, to these that almost all large scale conversions of non-Muslims are to be traced. Some of the orthodox and most of the unorthodox ṣūfīs were points of contact between the Muslims and the non-Muslims, and served as effective means of spiritual assimilation. As the doctrine of Immanence (*wahdah al-wujūd*) came to be more and more widely accepted and propagated in literature, a basis was provided not only for tolerance but also for a sharing of spiritual experience. The fact was accepted that "every people has its own way, its religion, a centre to which it turns for prayer" ; and, particularly in poetry, love, devotion and total dedication to the Beloved were emphasized and praised in such a manner that the purely legal or traditional rejection of *kufr*\* lost its meaning.

We have stated that the vast majority of the Indian Muslims have been Sunnis. Differences among them have taken the form of (a) insistence on *taqlīd*, which meant in practice strict adherence to the Sunni Ḥanafī; code of jurisprudence; (b) rejection of *taqlīd* in principle or on certain points ; (c) special emphasis on the *Sunnah*, the example of the Prophet, as deducible from the 'Hadīth' ; (d) emphasis on the *Qurān* as the real and immediate source of guidance ; (e) insistence that all the Prophet's companions are worthy of honour, and that there was nothing wrong with the election of the 'Khalifa hs' of the

\**Kufr* literally means "concealment", "denial".

Prophet ; and (f) giving a certain pre-eminence to 'Alī, without derogating from the honour due to the other three Khalifah. These differences are obviously matters of detail, and it seems incredible that they should have provoked conflicts, but they did. In the fifteenth century, Syed Muhammad of Jaunpur aroused violent opposition because it was alleged that he claimed to be the *Mahdī*, a personage who, it was commonly believed, would appear on the eve of the Resurrection to subdue, convert and reform all mankind. In fact, Syed Muhammad aimed at a reform that would restore Islām to its original purity, and was therefore forced to condemn the theologians, the practices and the superstitions of his own day. His condemnation by the official *'ulamā* (learned men) and the persecution of his immediate disciples led to retaliation. His followers, known as the *Mahdavīs* (or Ghair Mahdavīs, because they had given up belief in the coming of the *Mahdī*), turned into a sect so bitterly hostile to the other Muslims that they regarded it as their duty to fight and kill them. They tried to perform this duty at the risk of their own extermination. In the nineteenth century, differences between those who believed in and those who rejected *taqlīd* became acute and created considerable unrest, though they concerned such matters as the propriety or otherwise of raising the hands and saying *Āmīn* aloud during prayer.

The Ahmādis, followers of Mirzā Ghulām Ahmad of Qādiān (d. 1908 A.D.), call themselves Muslims and have been active propagandists of Islām. Some of them consider Mirzā Ghulām Ahmad to have been a Prophet (*nabi*), directly inspired by God; these are the orthodox Ahmādis or Qādiānīs. Others regard Mirzā Ghulām Ahmad as a reformer worthy of being followed, but desire to remain an integral part of the Muslim community. They belong to the moderate, Lāhorī school, which broke away from the Qādiānīs in 1914 A.D. Qādiān was included in India after the Partition, and the Ahmādī headquarters have been shifted to Pākistān.

Shī'ah means "supporter" or "partisan", and the first Shī'ahs were those who supported the claims and the cause of 'Alī. The

The Shī'ahs of India are divided into several sects, but the majority are Isna 'asharī, that is, those who believe in the Twelve *Imāms*\* being the rightful successors of the Prophet. They dissociate themselves positively and fervently from the people—mainly Companions of the Prophet—who were according to them, responsible for depriving 'Alī of what they believe to have been his just rights, both as a legal

\*The *Imāms* are 'Alī, Hasan, Husain, Zain al-'Ābidin, Muhammad Bāqar, Jā'far Ṣādiq, Mūsā al-Kāqim, 'Alī al-Riḍā, Muḥammad al-Taqī, 'Alī al-Naqī, Hasan 'Askari, Muḥammad al-Mahdī.

and a spiritual successor (*Imām*). The basic difference in matters of doctrine between them and the Sunnis is that they consider the *Imāms* to have been chosen by God, like the Prophets, and to be infallible interpreters and exponents of the true faith. The conflict between the Sunnis and the Shī'ahs is, however, more cultivated than real. They are as capable of living together amicably and intermarrying as of becoming implacably hostile. The rulers of Bijāpur, Ahmadnagar, Golconda, Murshidābād and Avadh were Shī'ahs and the cultural status of the Shī'ahs has been raised by the immigration of outstanding Irānians. It was considered meritorious that the Sunnī ruler should not allow Shī'ahs to gain power and prestige, and there have been cases of bitter and violent persecution; many Sunnī rulers, however, did not practise discrimination and some had strong Shī'ah leanings.

The Shī'ahs are found all over India, and in relatively larger numbers in Avadh, Rāmpur, Muzaffarnagar in Uttar Pradesh and Hyderābād in Andhra Pradesh.

The principal Shī'ah sects in India are those collectively called Ismā'īlī, and also Sab'iyah, who believe that the succession of *Imāms* stopped at the seventh. They are extremist Shī'ah sects in their opposition to the main body of Muslims, and have their own metaphysical doctrines and system of religious organization. The Khojās whose religious head is the Āghā Khān, and the Dā'ūdī and the Sulaimānī Bohoras are the principal communities to be classed among the Ismā'īlī sects.

The Khojās are found mainly in Bombay, Poona and Gujarāt State. The Dā'ūdī and Sulaimānī Bohoras also are centred in Gujarāt, Bombay and Hyderābād (Andhra Pradesh).

Many divergences in belief and practice among the Indian Muslims are due to incomplete conversion. It is probable that sections or the whole local body of a caste or a tribe or a community practising a certain trade or profession were converted because the head of the caste or tribe or community accepted Islām, and the conversion consisted in little more than the repetition of the *Kalimah*—“There is no god but *Allah*; Muhammad is the Prophet of *Allah*”. The person to whom the conversion was due—generally a *sūfi*—did not consider it feasible or politic to make the converts abjure all their old rituals and customs. These continued to be observed, and in course of time became a part of the religion of the converts. We have, therefore, had communities or groups calling themselves Muslim, like the Malkānā Rājputs of Uttar Pradesh and the Meos of Punjab, whose beliefs and practices were often inconsistent

with the teaching of Islām. Their number was fairly large, but the spread of education on one hand, and the missionary activities of the Hindus and the reformist zeal of the Muslims on the other, must have changed the picture.

One of the characteristic sociological features of Islām is its promotion of urban life. The first revelation to the Prophet was,

"Read, in the name of thy Father\* who created ;  
Islām, an urban religion created man from a clot of blood. Read, thy God is gracious. He taught man with the pen; He taught man who possessed no knowledge". The acquisition of knowledge was emphasized as a source of spiritual merit ; so was the earning of a livelihood through skilled personal labour. These teachings, combined with the outlook produced by trade, in which many prominent families of Mecca were engaged, and the spread of Islām among peoples whose life was concentrated in towns, gave Muslim culture a pronounced urban character. The Muslims who came to India, apart from the Arabs who settled in Sind and the ancestors of the Moplahs of Malabār, confined themselves as far as possible to towns. Here the restrictions placed on intercourse with non-Muslims could not be observed. These restrictions were few and mild enough from the social point of view. The marriage of a Muslim woman to a non-Muslim was absolutely forbidden, and the legality of a non-Muslim woman's marriage to a Muslim was conditional on her belonging to the *ahl-i-kitāb*.† But there were no restrictions on trade and employment or, from the Muslim side, on social intercourse. In the towns, therefore, a fairly rapid assimilation must have taken place, and it is demonstrable, in some cases, that the object of religious prejudice was the rural population, with which the Muslim townsman had little or no contact, and not the city-dwelling Hindu. In the cities a common culture was developed, to which both Muslims and Hindus contributed. The seat of this culture was the court, and it was there that it found its first expression.

Perhaps the first typically Hindu concept to infiltrate into the Muslim mind was belief in astrology and astrological predictions.

Hindu influences      But all men did not feel as important as kings and courtiers, and for most people astrological predictions mingled with superstitious beliefs in omens could be traced to the primeval fear of the unknown. Far more significant socially was the gradual acceptance of the idea of caste.

(a) Though it is a fact that Islām proclaimed the equality of all men before God, and did not recognize any distinctions based

\*This seems to me the best translation of *Rab*.

†Peoples whose religion was based on a Revealed Book.

on race or family, the social structure and economic organization of the period militated strongly against it. The Arabs maintained their family and tribal gradations, and the spread of Islām was for them synonymous with the expansion of Arab domination. There was also the institution of slavery. Islām abolished it in spirit and prepared the ground for its abolition in fact; but the *fīqh* also recognized the existence of slavery by making it a subject of legislation. Quite contrary to the principle of Islām, Muslim jurisprudence gave a legal status to monarchical government and to the possessors of power and prestige. By the thirteenth century, the Muslims could be regarded as practising a religious egalitarianism marred by the political and social domination of a minority. This was the condition when the Delhi Sultanate was established. The first Muslim rulers of North India were royal "slaves", that is, persons bought in the slave market, who were brought up in the court and assigned duties in accordance with the interest the ruler took in them and their talents. They were men without family antecedents and their political affiliations were based on self-interest. The historian Barani's almost rabid denunciation of "low-born" persons is a clear indication of the fact that the ruling minority was not able to transform itself into an aristocracy of birth. But it was an upper stratum of families to which were later added Afghān, Mughal and Irānian elements.

In this way a classification that has no religious or legal status came into existence; the term 'dhāt' used for it, is also used for "caste". The Muslims are supposed to belong to one of the four 'dhāts' Syed, Shajkh, Mughal and Pathān. The Syeds, rank highest, being regarded as descendants of the Prophet; the Shaikhs are believed to be of Arab origin, and therefore superior to the Mughals and the Pathāns. But the four 'dhāts' are largely hypothetical; there are gradations within each of them, and the number of converts who have succeeded in establishing an Arab or Turkish ancestry is so large that the vast majority of pedigrees are suspected of being inventions. Families interested in maintaining their status look to *kufw* rather than 'dhāt', while the 'dhāt' of Pathān, for instance, would include families with varying degrees of mixture of non-Pathān blood, *kufw* would mean just those families intermarriage between whom would ensure maintenance of their particular status, culture, manners and customs. How far distinctions of *kufw* and 'dhāt' have really mattered is a moot point, but their very existence shows the intrusion of ideas of caste, and it cannot be denied that, for a considerable proportion of educated and well-to-do families, observance of the restraints of *kufw* and 'dhāt' was almost a religious injunction. Among communities practising a

particular trade or profession, marriages outside the community have been quite unusual; for them the maintenance of their social identity is as essential as for the believers in caste.

(b) The position of women among Indian Muslims has been grossly inconsistent with the rights given to them by the *Qurān*. These rights were as follows : (1) The daughter was to get a share in the property of the father equal to one-half of the brother's share. (2) The consent of the woman was necessary for marriage; she was to be given *mehr* in accordance with her social position; and if the marriage took place when she was a minor, she could, after reaching the age of consent, demand its annulment. (3) Divorce was permissible under certain conditions. (4) Widows could remarry.

In India, the daughter's right to inherit has been superseded in many areas and among many communities and economic groups by custom or customary law. Some theologians have held that it was permissible for a sister to forego her rights to her father's property out of love for her brother or brothers, or out of regard for the fact that she would get all that she desired from her husband. Infant and child marriages or betrothals that were as binding as marriages have been quite common, and almost the general rule among the lower classes; the exercise of the girl's right to question such a marriage has been extremely rare. The woman's consent to marriage has throughout been formally attested by witnesses, but in practice the consent has been pre-arranged, without reference to the woman herself. *Mehr* is not dowry. It is not money and goods which the woman's parents provide, but money or property which the man has to give to the woman in absolute ownership before the marriage can be legally recognized and consummated. Though at every marriage the *mehr* has been fixed and announced, it has seldom provided the married woman the security it was meant to provide. The husband's right to divorce has been recognized, and among the lower classes women have been able to obtain separation or divorce. Among "respectable" families a divorce has been regarded as a disgrace, all the worse if it was the wife who demanded it. The law permitting widows to remarry was too clear to be overlooked; yet, until recent times, such marriages were effectively prevented, specially among upper classes, by the cultivation of the sentiment that, widowhood being the will of God, it was reprehensible for the widow and a disgrace for the family that she should marry again. The sentiment against widow remarriage was so strong in the early nineteenth century that Syed Ahmad Shahid deliberately married a widow in order to initiate this practice and force public opinion to recognize the widow's

legal rights. Women have been denied their full rights even in countries where they are not kept in seclusion. Among Indian Muslims the practice of seclusion (*pardāh*) acquired the force of law, and deprived women of the possibility of participating in social and cultural life.

(c) The Muslims have, strictly speaking, only two festivals, the 'Id al-Fiṭr', following the close of 'Ramādān', and the 'Id al-Az̄hā', the 10th of the month of 'Dhi'l Hijj' on the day after the Pilgrimage (*haj*). To these were added the 'Id-i-Milād', the celebration of the Prophet's birthday; the celebration of the death anniversary of Shaikh 'Abdul Qādir Gilānī, commonly known as *Pīr-i-Dastgīr*, and similar anniversaries of other saints. The *Muharram*, extending over ten days, was really a period of mourning, climaxing on the 10th day, when Shi'ahs and Sunnis joined together to commemorate the martyrdom of Imām Husain. 'Shab-i-Barāt', celebrated with fire-works and presents of *halva* (sweetmeats) seems to be the Muslim version of a Hindu festival. Living together with the Hindus, it was natural that the Muslims should both borrow and adapt and join in the celebration of Hindu festivals. A beginning was probably made in the *Mughal* court; there the *Diwālī* and *Nauroz*, the Irānian New Year's Day, and later *Holi* were given official status. Much larger was the number of customs observed within the family circle—birthdays, ceremonies connected with marriage and childbirth, and offerings made on the death anniversaries of ancestors and relatives. The death anniversaries ('urs) of saints have also been festive occasions, the most famous being those of Shaikh Mu'inud-din Ghishṭī, Syed Sālār Masud Ghāzi, Shaikh Niẓamu'd-dīn Auliāy Shaikh 'Alā'u'd-dīn Sābir in North India, Shaikh Gesu-darāz Bandā Nawāz at Gulbarga in the Deccan and Jhabrālam Bāsha at Tiruchchirāppalli in South India.

The form of Islām in India has been the result of the interaction of two powerful tendencies, one conservative, the other liberal. The conservative tendency has taken the form of insistence on jurisprudence of the Hanafī school being the correct and final expression of the Shari'ah, maintenance of the Shari'ah as embodied in this jurisprudence, and the condemnation of innovation and heresy. For the conservative extremists, of whom the '*ahl-i-Hadīth*' are an outstanding example, Hanafī jurisprudence itself represents an aberration, because it has mixed extraneous elements with the pure faith based on the *Qurān* and the '*Hadīth*'. The liberal conservatives, of whom Shaikh 'Ābdul Wahhāb Muttaqī (b. 1536 A.D.) provides an instance, felt that the interpreters of this jurisprudence in the field of

both theology and law conceived it as too rigid, and were, therefore, intolerant and aggressive in its application to persons and ideas. The conservatives anyhow were unanimous in their assertion that the Shari'ah was perfect both in itself and in its applicability to all circumstances and situations, and the question of any revision or amendment because of a change in circumstances did not arise.

The liberal tendency has been represented by orthodox and unorthodox ṣūfis and by intellectuals. The orthodox ṣūfi insisted on the observance of the Shari'ah by their disciples, but they also introduced new and ultimately quite subversive ideas and practices. Their concept of the Shaikh created an intermediary between God and the individual believer; they declared it obligatory to obey all the injunctions in regard to prayer and fasting, but by introducing supererogatory prayers and fasts they made a shift in emphasis because of which Islām became much more a personal and much less a congregational religion. Shaikh Nizāmu'd-dīn distinguished between the "intransitive" and the "transitive" acts of obedience.\* The benefit of the "intransitive" act was limited to the individual who performed them, and the motive of the performance did not need to be scrutinized. Shaikh Nizāmu'd-dīn and other ṣūfis as well, were inclined to equate the status of the repentant sinner with that of the person constant in his piety, if not to give it preference. The relatively unorthodox ṣūfis, proceeding from the premises of the Unity of all Existence, attempted to pull down the walls which orthodox jurisprudence had raised to distinguish and separate the Muslims from the non-Muslims. Shaikh Muhibullah of Allahābād, who lived in the seventeenth century, declared that the non-Muslim subjects of a Muslim ruler were as much his responsibility as his Muslim subjects, but his was a lone voice. The unorthodox ṣūfis went much further. Their views, however, were not considered authoritative, because they were not held answerable for what they said or did.

Muslim poets and men of culture have been remarkable for their freedom of thought, but the Indian Muslims have no intellectual, as distinct from a religious tradition. The use of reason in matters of religion was opposed to the principle of *taqlīd*, and was already regarded as an offence at the time when Islām spread in India. But the histories do mention intellectuals who, from the orthodox point of view, "perverted" the faith of kings and courtiers; Shaikh Mubārak and his sons, Fāidī and 'Abul Faḍl, are outstanding examples. Still, it appears that Sir Syed Ahmad Khān (1817-1898 A.D.) was the first to present an intellectual approach to religion. He held it to be erroneous and harmful to believe in *taqlīd*,

\* The fulfilment of religious commands is also called *ṭa'at*, or "obedience".

and enjoined the Muslims to resolve upon investigating all matters, whether they concerned religion or worldly life. Circumstances kept on changing, men were faced daily with new problems and needs, and the dead could not be asked questions which were not material facts of life in their time. Exercising his own right to independent thinking, Sir Syed declared that statements in the *Qurān* and the '*Hadīth*' in regard to the Person and Attributes of God were allegorical or metaphorical and should not be taken literally; that slavery was not permissible in any form; that usury was prohibited, but not the taking of interest on Government Promissory Notes and loans; that dressing like the non-Muslims and eating like them was not forbidden; that, side by side with love based on community of faith, there could be love based on common humanity.

Apart from being an "innovator", Sir Syed was also an apologist. Syed Amīr 'Ali, whose books, *The Spirit of Islam* and *The History of the Saracens* have come to be regarded as classics, presented the teachings of Islām in a form that was both rational and orthodox. *The History of the Saracens* has the qualities of apologetic literature, but is also sound history. As a result of the awakening in the latter decades of the nineteenth century, the inclination towards apologetics—and the tendency to mistake it for an understanding and an interpretation of Islām—became stronger. Alṭāf Ḥusain Ḥālī wrote his famous *Musaddas* in which the contemporary decadence of the Muslims was contrasted with their erstwhile splendour. The '*Shikwah*' and '*Jawāb-i-Shikwah*' of Muhammad Iqbāl followed the same lines. Iqbāl also propounded a half philosophical, half poetic doctrine of the Self—its sentimental appeal was stupendous. Maulānā Abul 'Ālā Maudūdī has given elaborate form to the criticism of western thought and civilization, which was one of the facets of apologetic literature. He has also proposed an organization of orthodoxy that could be called a theocracy or an Islāmic State.

A different type of contribution to Islāmic thought was made by Maulānā Abul Kalām Āzād. In his '*Tad̄kirah*', he expounded the view that some of the highest moral and spiritual values of Islām had been obscured by a legalistic and narrow interpretation of its teachings. In his *Tarjumān al-Qurān* he discussed in detail the attributes of God given in the opening chapter of the *Qurān*, and came to the conclusion that the basis of devotion to God should be the belief that human thought and activity must reflect His fostering care, His graciousness, His mercy and His justice. It should be the function of the true believer to help in the development of the society to which he belongs, from stage to stage, in accordance with its needs and aptitudes, in order that it might

fulfil itself. He should be gracious, merciful and righteous. He should not passively accept what is wrong, but strive actively for the justice, the balance which is seen in the work of God, with the realization that patient waiting for results is a part of faith in God and His universal order.

The political and social consequences of Maulānā Azād's views are obvious. But this line of thought has not been followed up. There appears to be a tendency among Indian Muslims to form two rather amorphous groups, one holding that a reconciliation between the ideals of a secular State and the doctrines of Islām must somehow be achieved, the other convinced that the traditional identity of the Muslims as a religious community should be maintained.

## 6. *Sikhism*

Like Buddhism and Jainism, Sikhism has developed out of Hinduism into a distinct religion with belief in the ten Gurus, and reverence for the Holy Book *Guru Granth Sāhib*, as also for certain symbols, ceremonies, shrines and places of pilgrimage. Yet the lines which distinguish Sikhism from Hinduism are not sharp and clear-cut, the basic ethical values in the two being more or less the same.

The most distinguishing feature of Sikhism is its emphasis on not renouncing worldly activities. A Sikh believes implicitly in the teachings of the ten Gurus and the *Guru Nānak Granth Sāhib*. Of the ten Gurus three in particular—Nānak, Arjan and Gobind Singh—have left a deep impress of their personalities on Sikhism. Guru Nānak (1469-1539), founder of the Sikh religion, preached the unity of Godhead, the obligation of leading a pure life, the abolition of caste and the futility of ritual and form. There was nothing new or startling about this, the common theme of all the reformers of the time. Nānak's real greatness lay in the fact that, in an age troubled by doubts and uncertainties, his words rang out loud and clear like a trumpet. His fundamental teachings are contained in his verses known as *Japjī*, rightly considered to be the epitome and indeed the main inspiration of the *Guru Granth Sāhib*.

Guru Nānak was succeeded by nine other Gurus—Āngad (1539-1552), Amar Dās (1552-1574), Rām Dās (1574-1581), Arjan (1581-1606), Har Gobind (1606-1645), Har Rāi (1645-1661), Har Kṛṣṇ (1661-1664), Teg Bahādur (1664-1675), and Gobind Singh

(1675-1708). Guru Angad improved upon the old Panjābī script, which came to be known as *Gurmukhī*. Guru Amar Dās was mainly interested in social reform, particularly the emancipation of women, from *pardāh* and *satī*. Nānak's successors None could see him without partaking of the food prepared in the common kitchen. Guru Rām Dās provided the Sikhs with a rallying centre by laying the foundation of Rāmdāspur or *Guru kā Chak*, now known as Amritsar. It was Guru Arjan who infused vigour into Sikhism. He increased the importance of Amritsar by making it his headquarters, completing the construction of the tank, and building a temple—*Har Mandir* (Temple of God)—in its midst. He also built a temple at Tarn Tāran and founded the city of Kartārpur, both of which became important places of pilgrimage. He considerably extended the system of collecting tithes. His most important contribution was the compilation of the *Ādi Granth* or the *Guru Granth*. He incurred the enmity of Emperor Jahāngīr on account of his religious activities and, having been accused of giving refuge to the rebel Prince Khusro, he was tortured to death in 1606.

The martyrdom of Guru Arjan was a turning-point in the history of Sikhism; it created a rift between the Sikhs and the Mughals and started the process by which Sikhism became a militant Church. The first significant step in this direction was taken by Guru Har Gobind, who sanctioned the use of steel in the defence of *Dharma* and for the protection of the oppressed. He wore two swords representing the spiritual and temporal authority—*Pīrī* and *Mīrī*. Events moved fast to a crisis in the reign of Emperor Aurangzeb, who ordered Guru Teg Bahādur to be put to death (1675) on account of his proselytizing activities and for having taken up the cause of Kashmīr Hindus. Religious persecution inevitably paved the way for the transformation of Sikhism into a militant Church under Guru Gobind Singh.

Guru Gobind Singh realized the imperative necessity of raising the morale of the Sikhs by giving them a distinct individuality.

This he did by introducing a new form of baptism.

*The Khālsā* On *Baisākhī* Day in 1699 he baptised five of his followers, known as *Panj Piyāre*, the Five Beloved Ones—they had answered his call to sacrifice their lives for the sake of the Guru and *Dharma*. These five formed a new fraternity, which the Guru named the *Khālsā* of *Wāhēguru* or “God’s Own”. The ceremony of *pāhul* or baptismal “cleansing” was simple. The Guru poured water in an iron vessel, stirred it with a two-edged dagger and recited compositions of the earlier Gurus and his own while his wife threw in sweets (*patāse*),

thus making it *amrt*, "the water of immortality". The five disciples drank out of the same bowl and were given new names with the suffix "Singh" (lion) attached to them. As the outward and visible signs of this discipline, they were enjoined to wear the five "K's", namely, *kes* (long hair), *Kanghā* (comb), *kachā* (a pair of shorts), *karā* (iron bangle), and *kirpān* (sword). They were further asked to follow four rules of conduct: not to cut the hair; to abstain from smoking tobacco and consuming alcoholic drinks; to avoid eating kosher meat; and to refrain from adultery. The ceremony concluded with the Guru hailing them with a new greeting—"Wāhēguru ji kā Khālsā; Wāhēguru ji ki Fateh", (The Khālsā belongs to God; Victory be to Him). Guru Gobind Singh was not content with baptising the Five, but he also had himself baptised by them, thus emphasizing that the Guru and his disciples were knit together in one common brotherhood. The initiation of a Guru by his disciples was a unique step, unknown in the history of religions. Thus was born on *Baisākhī* Day of 1699 the Khālsā, the militant Church, which was to rejuvenate Sikhism. With a new script, a new scripture, new centres of worship and new symbols and ceremonies, the Sikhs came to have a distinct individuality. Finally, Guru Gobind Singh declared the line of personal Gurus at an end, and installed the *Granth* as the Guru, the symbolic representation of the ten Gurus. Guru Gobind Singh was a versatile scholar; his writings are available under the title of *Dasam Granth* or the Book of the Tenth Guru. His life was one long struggle against the Mughals and their allies. His two sons lost their lives in the battle of Chamkaur while two others (who fell into the hands of the enemy) were cruelly murdered under the orders of the Muslim Governor of Sirhind. The blood of the martyrs nurtured the Sikh community and in an incredibly short time the Sikhs became a political force in Punjab.

Although the *Dasam Granth* is considered to be a sacred book, it is the *Ādi Granth* (*Granth Sāhib*) which is regarded as the *Guru* and the holy scripture of the Sikhs. The *Guru Granth Sāhib* is considered to be the symbolic representation of the ten Gurus and hence an object of deep reverence. Although some spade-work had been already done, the systematic compilation of the *Granth* was undertaken by Guru Arjan and completed in 1604 A.D. The work contains the writings of the first five Gurus and the ninth Guru (including Guru Arjan's famous composition—the *Sukhmanī* or "Psalm of Peace"); the writings of sixteen Hindu and Muslim saints, including Jaidev, Rāmānand, Dhanna, Nāmdev, Rām Dās, Farīd, Mīrābāī and Kabīr; and the compositions of *bhāts* or bards, who were contemporaries of the Gurus. The

first few pages contain verses of surpassing interest—Guru Nānak's *Japjī*, *So Dar* (that door), *So Purkh* (that Supreme Being) and *Kirtan Sohilā* (song of praise); then follow the main body of the text arranged according to thirty-one musical measures or Rāgas; and finally we have the Bhog (Epilogue) and an appendix, called the *Rāg Mālā* (enumeration of Rāgas and Rāginīs). The *Granth* is written partly in Panjābī, and partly in a kind of *Sant-bhāṣā* (a common language developed by the saints in North India), Braj-bhāṣā, dialect of Old Hindī, and Standard Delhi Hindī, mixed with some Panjābī forms and forms of archaic Apabhrāṁśa words and expressions. A historical document, the *Granth* not only epitomizes the wisdom of the ages but also preserves the compositions of the Sikh Gurus in their original form. The Sikh Gurus employed the vehicle of verse, which could not be altered by copyists.

The basic teaching of Sikhism is an uncompromising belief in monotheism. The *Mūl Mantra* (preamble to the *Japjī*) strikes the keynote of the Sikh religion : "There is but one God. He is the Supreme Truth". God or *Sat Nām* has no form or substance but His grace can be invoked by faith and righteous living. Sikhism believes with Hinduism in the doctrines of the immortality of the soul and transmigration. Meditation on God, utterance of the Name (*Nām*), the guidance of the Guru, the company of Saints, righteous living, and the service of humanity (*sevā*) are the means of salvation. The Name, uttered not mechanically but with faith and meditation, is the best form of worship. "They who meditate on God are emancipated ; for them death's noose is broken." "The name of the Lord is immaculate ; he who would know must have faith." Besides meditation on God and utterance of the Name, the disciples should follow the Guru's instructions and chant his hymns. "Truth is above everything, but higher still is true living." It is necessary to conquer the five deadly sins—lust, anger, greed, attachment and egoism. We can love God only when we cease to love ourselves. We must first destroy the ego. Righteous living and the destruction of egoism lead to the eternal bliss of merging into the Divine—"As water mingles with water, so the light merges in the light." Sikh religion is opposed to austere asceticism and emphasizes the ideal of achieving saintliness as a member of society. "Abide in God amid the impurities of the world ; thus shalt thou find the way to salvation." A strong element of predestination is traceable in the Sikh hymns. But in spite of frequent allusions to God's pre-ordained order, the importance of action (*karma*) is emphasized. "The Lord driveth thee

as is His Will, but His pen writeth as are thy deeds." Sikh religion prohibits idolatry, caste system, *sati*, use of wine and tobacco smoking. It stresses the importance of leading a good moral life and, therefore, inculcates moral and domestic virtues, such as loyalty, gratitude for all favours received, philanthropy, justice, truth and honesty.

A Sikh temple, called gurdwāra, is an important centre of Sikh community life. There are in India today four famous centres of this kind—at Amritsar, Patna, Anandpur and Nānder. The Golden Temple at Amritsar is the holiest. The city of Amritsar is indeed the most sacred place of the Sikhs. Delhi has two famous Sikh shrines—Gurdwāra Sis-Ganj (the place of martyrdom of Guru Teg Bahādur) and Gurdwāra Rikāb Ganj (where his dead body was cremated). The Sikh shrines at Kartāpur and Dera Baba Nānak in Punjab are equally famous. Some of the famous Sikh shrines are in Pākistān—Nankāna Sāhib (birth-place of Guru Nānak), Dehra Sāhib in Lahore (place of martyrdom of Guru Arjan) and Panjā Sāhib near Taxila.

Symbols, the five "K's" already named, give Sikhism a distinct individuality. A baptised Sikh is easily recognized by his beard, long hair and turban. He recites compositions of Sikh rituals the Gurus as his daily prayer at fixed times of the day—the *Japī* of Guru Nānak and *Jāp* and *Savvayas* of Guru Gobind Singh in the morning, *Rehrās* in the evening and *Sohilā* at night. He also participates in the congregational prayer.

A Sikh attaches great importance to the reading of the *Granth*. Ordinarily, the Book is opened at any page and the reading starts with any passage. Sometimes the reading of the whole book is undertaken by a congregation or a family as *Saptah Pāth* (a cover-to-cover reading in seven days) or as *Akhānd Pāth* (uninterrupted reading of the Book in 48 hours).

*Amṛt-pān* ceremony or Sikh Baptism is the rite by which a Sikh becomes a member of the *Panth* or the Khālsā Brotherhood. A candidate, after bathing and putting on clean clothes and wearing the five "K's", stands reverently with folded palms before the congregation of five (representing the *Panj Piyāre*) one of whom explains to him the principles of Sikhism and the discipline which he will have to observe. On his acceptance of the code of conduct, the *Panj Piyāre* add *patāse* to the water in an iron basin and stir it with a double-edged dagger, while chanting verses from the two Granths. This *amṛt* is sprinkled on the candidate's head and face and part of it is given to him to drink. He repeats certain vows which constitute *rehat*, Sikh rules of conduct. *Karāh Parsād* (communion food) is distributed at the end of the ceremony, and

all those who are baptized in the batch eat out of the same dish.

Of the Sikh festivals, *Baisākhī* marks the birth of the Khālsā, two *Gur Purbs* commemorate the birthdays of Guru Nānak and Guru Gobind Singh, and two others the martyrdom of Guru Arjan and Guru Teg Bahādur. In common with the Hindus, the Sikhs celebrate *Diwālī* and also *Holi* in the form of *Holā Mahallā*.

In the course of three centuries a number of Sikh sects sprang up but most of them have lost their importance—Nirankāris, Nānak-panthīs, Niranjanīs, Suthra-Shāhīs, Sanwal-Shāhīs, Dhirmalīas, Sevāpanthīs, Sat Kartārīs, Nirmalās, and others. At present some of the important groups are the Nihangs, Nāmdhāris and Udāsīs. The Nihangs are conspicuous by their dark blue dress and peaked turban, often surmounted with a steel disc. Some of them wear a yellow turban under the blue one, leaving a yellow band across the forehead. The order was founded by Guru Gobind Singh. The Nihangs regard themselves as the soldiers of Guru Gobind Singh. They are most particular in retaining the five "K's" and in preserving every outward form prescribed by Guru Gobind Singh. Full of memories of the glorious days of the Khālsā, they recall with pride how their leader, Mān Singh, bore Guru Gobind Singh on his back and carried him to safety through the line of *Mughal* sentries. In the reign of Mahārājā Ranjit Singh they rose into importance under the leadership of the celebrated Phula Singh.

The Akālis came into prominence early in the twentieth century when they launched a vigorous campaign to oust the hereditary priests from the control of the gurdwāras. Several incidents took place, among them the Nankāna massacre (1921) and the struggle for the possession of Guru-kā-bāgh (1922). Finally, the Akāli demand was conceded with the passing of the Gurdwāra Act (1925). Since then the Akālis have been deeply embroiled in politics and are now a power to reckon with in Punjab.

The Nāmdhāris or Kūkas form a cohesive group among the Sikhs. Their distinctive headgear, pure white dress and flat pugree, and their devotion to their Guru, whom they regard as the direct spiritual descendant of Guru Gobind Singh, mark them off from the other Sikhs. While chanting the sacred hymns they work themselves up into an ecstatic frenzy and emit cries (*kooks*); that is why they are called Kūkas. The Kūka movement owed its origin to the reforming zeal of Bhagat Jawahar Mal (Sain Sahib) and Baba Balak Singh, whose chief centre of missionary activities was Hazro, now in Pākistān. The movement took on a political bias under the dynamic leadership of Baba Ram Singh (1815-1884), who set up his headquarters at Bhaini in the Ludhiāna District. It was opposed to foreign

rule. In 1870-72, the murder of some butchers in Amritsar, and the efforts of the Nāmdhārīs to stop at Malerkotla the slaughter of cows which they invest with sanctity led to the exile of Baba Ram Singh to Rangoon and the execution of many of his followers.

Baba Ram Singh was succeeded by Hari Singh, and then came Partap Singh. A strong supporter of the National Movement, Partap Singh insisted that his followers should wear Swadeshi cloth, preferably Khaddar ; he himself set the example. At the Lahore session of the Indian National Congress in 1929, when the resolution for Independence was passed, it was a band of Nāmdhārīs on horseback who led the procession. Today the Nāmdhārīs are a well-knit group with their chief centres at Bhaini in the Ludhiāna District and at Sirsā in Hissār.

The Udāsīs are ascetics and form a clear-cut group. This ascetic order was founded by Srī Chand, a son of Guru Nānak. Guru Amar Dās excommunicated the order but it was revived by Gurdittā, the son of the sixth Guru. The Udāsīs were divided into four *dhuāns* (hearts) or orders, called after four noted Udāsīs—Almast, Phūl, Gobind and Bābā Harīsā. Later on, there came to be developed new centres of missionary work, called *Bakshishes* or bounties, of which the most important were Bhagat Bhagwān and Sangat Sāhib. Some of the Udāsīs have matted locks. Their dress is of a saffron colour but many wear only the waist-cloth. The psalms and prayers of Guru Nānak are preserved in their simple rituals of worship. Some of their rites, however, reflect Hinduism. Their service comprises the ringing of bells, blare of instruments, chanting of hymns, and waving of lights before the *Ādi Granth* and the picture of Guru Nānak.

Nirmalās trace their origin to Guru Gobind Singh's time, when a number of scholars were sent to Vārānasi to study Sanskrit and the Hindu Scriptures ; they are the traditional exponents of the *Ādi Granth* in the spirit of the Vedānta.

Before India's independence the Sikhs numbered 5,691,447, scattered over Northern India. The partition of Punjab (1947) led to considerable redistribution of the Sikh population. According to the Census of 1961, the Sikhs are found in large numbers in Punjab (6,769,129), Uttar Pradesh (283,737), Rājasthān (274,198) and Delhi (203,916). They are also found in other States of India. The Sikh population rose from 6,219,134 in 1951 to 7,845,915 in 1961.

The Sikhs rank among the best soldiers of India's Armed Forces. They are also excellent sportsmen. They are good cultivators and make fine colonists. Hardy and energetic, they have

shown considerable enterprise in venturing abroad. There are small but thriving colonies of Sikh settlers in Canada, the U.S.A., Great Britain and East Africa.

### *7. Christianity*

The Christians of India are the third largest religious group in the Union. Like the rest of their fellow citizens they have been profoundly influenced by the momentous changes that have taken place in the country in recent times. Their numerical strength has risen; their spirit and outlook have changed in many ways.

While controversy still continues among scholars with regard to the preaching and martyrdom in South India of St. Thomas,

Early Christian communities one of the twelve Apostles of Jesus, there is a growing volume of opinion in favour of the popular tradition. Vincent Smith, after careful study of the evidence, came to the conclusion that, while the truth of the common belief cannot be proved, it is better supported than any other explanation of the life and death of the saint. The early Syrian Fathers are unanimous in their assertion that St. Thomas was martyred in India. Moreover, it has been proved that commercial contacts between South India and the ports of the Roman Empire even prior to the Christian era were frequent. It could not have been difficult for the saint to land in a port in Malabār. We may accordingly conclude that the tradition that St. Thomas established the first Christian community in South India and met his death near Madras, as the Christians of Malabār have always asserted, has a large measure of probability.

There is a later tradition that another Thomas, a Bishop from Edessa, landed in Malabār with a group of Christians from Irān about 345 A.D. The first unquestionable proof of the presence of Christians in India comes from Cosmas Indicopleustes, who visited India about 535 A.D. and wrote an account of his travels. He found Christian communities in Malabār, and at Kalyān near Bombay. A certain type of Cross, known as the Thomas Cross, has been found both in Malabār and in Mylaporé, and the inscription in Persian shows that its date is at least as early as the seventh century. In the eighth century King Alfred sent two priests with gifts to the Christians of India in honour of St. Thomas. In the thirteenth century both Marco Polo and John of Monte Corvino visited South India and saw the Christian communities there. Recent research has proved that in the earlier years these

Christians were in communion with Rome, but later, under the influence of the Nestorian Patriarchs of Irān, they drifted away from that allegiance, though there was no overt breach.

The next stage in the preaching of Christianity in India begins with the coming of the Portuguese. Vasco da Gama reached India in 1498 A.D. Within two years after his arrival, Franciscan missionaries were sent to India, and in 1534 Goa was created a Bishopric.

Eight years later, in 1542, the most famous of all modern missionaries, St. Francis Xavier, reached Goa. He spent ten years in East Asia, mainly in India, but made journeys to the Portuguese establishments in the Chinese Archipelago, and a memorable visit to Japan; a man fired by religious zeal and a warm love for the poor, travelling ceaselessly and converting many thousands to Christianity. The chief field of his activities was the extreme south of the Peninsula, specially among the Parawar, and along the West Coast—in Goa and Travancore-Cochin. He died, worn out, in 1552, in a small island off the Chinese coast near Canton. His work was continued by many Jesuit, Franciscan, and other missionaries.

But conversion at that time implied an undesirable break from the cultural and social traditions of India and the adoption of

European names and ways of living, which detached the Christians from their social ambit. This method of "Europeanizing" the converts was at variance

<sup>Opposition to "Europeanizing" converts</sup> with the earlier traditions of the Christian Church and compromised the purely religious character of Christian evangelism. The assistance of the political power of Portugal in spreading Christianity in territory subject to it tended in the same direction. In reaction against this, another famous Jesuit missionary, Fr. Robert de Nobili, began the system of "adaptation" by which, while the essential tenets of Christianity were safeguarded, the external ways of living and the artistic expression of religious devotion of the converts were made to conform to their Indian traditions. Fr. de Nobili reached India in 1605, and established himself in the ancient town of Madurai, outside Portuguese influence, in 1606. He mastered Sanskrit and Tamil, studied the Hindu scriptures and discussed with the Hindu *pandits* on terms of equality. He himself lived like a *sannyāsi* as regards food, clothing and lodging, and demonstrated that in becoming a Christian, one did not become a "Feringhee". By his preaching a large number of Hindus of high caste became Christians and their descendants form a good proportion of the Christians of Tamilnād today. Among those who followed the method of Fr. de Nobili,

the most famous were St. John de Britto, martyred in Marava in 1693, and Joseph Beschi, known as Viramāmunivar, whose mastery of Tamil was such that his epic poem *Tembavāni* is considered a classic of Tamil literature. Before this Thomas Stephens, also a Jesuit, one of the first Englishmen to come to India, had written a Christian Purāṇa in Marāṭhī; this also has obtained high praise from Marāṭhī critics. It may also be noted that the first book printed in India in an Indian language was brought out in Cochin by the Jesuit Br. John Gonsalves, in 1577.

Under Catholic missionary activity during this period we should also include the Jesuit Missions to the Court of Emperor

Akbar, and the establishment of small Christian communities in several cities of the North. There to Akbar

Jesuit Missions were three distinct Missions to the Court of Akbar, from 1580 to 1605, and the Jesuits continued to work in the Mughal empire during the succeeding reigns. Akbar welcomed the Jesuits and loved to hear them discourse on religion along with the Hindu *pandits* and Muslim *divines*. Among the Jesuits were able men like Jerome Xavier, Rudolf Aquaviva, and Antonio Monserrat. They sent every year to the Superior in Rome reports of their Missions; these contain vivid descriptions of the Mughal court, and are valuable historical documents. Monserrat in particular kept a personal diary during the first Mission, and later expanded it into a continuous narrative. It contains a fascinating description of Akbar's personality and of his court.

An important event in the history of the Syrian Christians during this period was the Synod of Diamper (Udayamperūr near

Cochin) in 1599, when the greater part of the Syrian Church was once again brought into communion with Rome. They continued to keep Syriac in their

Synod of Diamper Mass and sacramental ceremonies as they do to this day. Those Syrian Christians who are not united with the See of Rome are mainly of two groups—the Jacobites and the Marthomites. The former are nearer to the Catholics, holding almost all doctrines in common except the primacy of the Pope and some points of lesser importance. The Marthomites are nearer to the Protestants and Evangelical bodies.

Protestant missionary work in India began in 1705, when the Danish Lutheran missionaries—Bartholomew Ziegenbalg and

Henry Plutschau—founded the Mission of Tranquebar in the kingdom of Thanjavūr. Ziegenbalg died at the early age of 36 after he had translated the Bible in Tamil and made a beginning of evangelizing the Tamil people. But the most famous name among the Lutheran missionaries of the

Early Protestant Missions

South is that of Christian Friedrich Schwartz, who reached Cuddalore in South India in 1750. After working for some ten years in Tranquebar, he settled in Tiruchchirāppalli and secured the patronage and encouragement of the Nawāb of Arcot and of the Rājā of Thanjavūr. The Rājā even entrusted to him the education of his son. Schwartz laboured hard for the propagation of the Gospel, travelled widely and established many schools. At the time of his death in 1798, the Protestant Christians of the Danish Mission were about 20,000 in number.

The next important date in the history of the Protestant Missions is the establishment of the Baptist Mission in Serampore by William Carey, who reached India in 1792. Carey was sent out by the Baptist Missionary Society, founded some time before in England. But the East India Company refused to countenance missionary work, and Carey began his labours at Serampore—a station established by Danish Moravian missionaries. It was here that he, with Marshman and Ward, began the work of translating the Bible into Bengali. It is noteworthy that Carey mastered not only Bengali, but also Sanskrit, Hindi and Marāṭhī, and translated the Bible into these languages. It was from the same Serampore press that the first Bengali newspaper, *Samāchār Darpan*, was brought out in 1818.

The contribution of the missionaries to the development of the vernacular literatures of India was of exceptional importance. Translations of the Bible in a score of languages, and the writing of catechisms or books of doctrinal instruction, had a marked influence in developing prose writing in Indian languages. Missionaries were among the first to prepare accurate grammars and dictionaries in these languages. From Thomas Stephens and Beschi, Ziegenbalg, Carey and other translators of the Bible, down to Bishop Caldwell and the lexicographers of Tamil, Malayālam, and Kannāda in recent years, the role of the missionaries in fostering the use and growth of the regional languages cannot be exaggerated.

To this must be added the value of the historical records they have left, the descriptions of the country, of the people and their customs. Mention has been made of the annual letters of the Jesuits and the Diary of Fr. Monserrat. In view of the great mass of documents it is not possible to mention many names; but the Journal of Bishop Heber and the famous work *Hindu Manners. Customs and Ceremonies* by Abbe Dubois, who was in India from 1792 to 1823, should be singled out. The importance of this in a country which had hardly any tradition of maintaining accurate historical records will be easily understood.

Although the East India Company did not encourage missionary work in its territory, it appointed Anglican chaplains to minister to its employees and officials. Many of them were imbued with missionary zeal and did much to create interest in Indian Missions in English circles.

Anglican  
Missions Noteworthy among them were David Brown (1787-1812), Claudius Buchanan (1797-1809), Thomas C. Thomason (1808), and Daniel Corrie. The best known, however, was Henry Martyn, who reached Calcutta in 1806. In 1813, the Company agreed to permit missionary work by Anglican bodies. This was due mainly to the efforts of Charles Grant, who became Chairman of the Court of Directors of the East India Company at this time. The Bishopric of Calcutta was established and Middleton became the first Bishop. His successor was the famous Bishop Heber. Since then important missionary societies of the Anglican Church, like the Society for the Propagation of the Gospel and the Church Missionary Society have worked with zeal and success in various parts of India. The Lutheran Mission of Tirunelveli founded by Schwartz was finally handed over to the Society for the Propagation of the Gospel in 1825. English missionaries of the Anglican Orders rapidly increased in the South and in 1835 the first Anglican Bishopric of Madras, and some time later that of Tirunelveli, were created.

Other Protestant denominations started missionary work in India from the early years of the 19th century. They did valuable work in the North, whereas the Catholic missionaries were most numerous and most active in the South, except for the great Mission of Rānchi, where the celebrated Fr. Constantine Lievens began work after 1880. The Protestant Mission of Rānchi was founded in 1845 by the Lutheran Pastor Goesner and achieved great success among the Kols. The American Board of Foreign Missions started sending out missionaries of various denominations as early as 1812. In 1833 they started the Madurai Mission, and soon after began working in Madras and in the Arcot District. In 1831 they began work at Ahmadnagar in the Marāthā area. The American Presbyterians chose the United Provinces (Uttar Pradesh) and Punjab as the field of their activities. They established stations at Ludhiāna (1834), Allahābād (1836), Jullundur (1846), Ambāla (1848), Lahore (1849), and Siālkot (1855). The American Baptists began their famous Telugu Mission, destined to achieve outstanding success, in 1840, and the important Assam Mission in 1841. The Lutheran Mission of Rānchi has been mentioned already. Of other Lutheran Missions, the best known is

the Basel Mission, which began work in Mangalore in 1838 and spread out into other Kannada-speaking areas like Dhārwār and Hubli. The work of the Danish Lutherans in the Tamil country was later taken by the Germans of the Leipzig Missionary Society. The Armenian merchants in India built their own churches but did little evangelical work. They have now churches in Calcutta, Bombay, Madras, Surat, and a few other places.

A personality of exceptional importance in the expansion of Protestant missionary work was Alexander Duff, the first missionary of the Established Church of Scotland. He Duff and English education advocated western education for Indians, an idea which had the strong support of Raja Rammohun Roy. Alexander Duff was the foremost pioneer in the remarkable work of Christian missionaries in the field of higher education. A colleague of his, Dr. John Wilson, founded Wilson College in Bombay. Two other names from among many may be mentioned: Dr. William Miller of the Madras Christian College, and Father Francis Bertram of St. Joseph's College, Trichinopoly (Tiruchchirāppalli), who later founded the Loyola College in Madras.

The Revolt of 1857 brought about a crisis in the fortunes of the Christians of India. Several English speaking Protestant missionaries and their converts lost their lives in various parts of the country. But in the long period of peace and progress which followed the suppression of the revolt of 1857, the Indian Missions enjoyed exceptional prosperity. While the Government adhered to the policy of religious neutrality, there was a general recognition of the valuable role which the missionaries were playing in educational and social work. The system of grants-in-aid for education was fully utilized by the Missions, both Catholic and Protestant. Moreover, the number of missionaries from all nations increased considerably. Among them were American missionaries of many denominations and their financial resources facilitated the development of medical and social work. In addition to the denominations already enumerated, mention may be made of Methodists, Congregationalists, the Scottish and Canadian Presbyterians, and the Salvation Army. Special mention should also be made of the International Y.M.C.A., and Y.W.C.A. Among the Catholics, in addition to the Jesuits, the Franciscans, Capuchins, and Fathers of the Foreign Missions of Paris, many other societies have begun work—the Benedictines, Dominicans, Salesians and foreign missionaries of Milan. The principal features of the work of the Christian Missions during this modern period may be briefly described.

First, there is the extraordinary development of the educational work of the Missions, with which increasing numbers of Indian priests, pastors and laymen have been associated. Christian colleges in the principal cities are among the foremost educational institutions in India. A noteworthy development was the promotion of education among women, and in this too the Christian Missions continue to play a prominent part. There are over 90 first grade colleges for men and women in India, 800 high schools, 1,500 middle schools, and thousands of primary and elementary schools, under Christian management.

The second important feature of modern Christian activity in India is the development of social work. The education of women, just noted, may be considered under this aspect as well. Other social enterprises were the foundation of orphanages for the care of abandoned children, homes for the aged and the incapacitated, hospitals, dispensaries and sanatoriums for lepers and for tuberculosis patients. The Christians of India conduct 400 hospitals and about 800 dispensaries; mention may be made also of the important Christian Medical College at Vellore. To this should be added their achievement in raising of the status of the Scheduled Tribes. While this was primarily a missionary enterprise aimed at religious conversion, its social consequences were far-reaching. Perhaps the greatest success of the Christian Missions in this field was attained first among the Ādivāsis of Chota Nāgpur and then among the Backward Classes in the Telugu country.

In connection with the expansion of educational and social work of the Christian Missions, it is necessary to emphasize the increasing role of women in modern times. The Catholics have a large number of nuns, both Indian and foreign, working in schools and colleges and Mission stations. Among them are the Sisters of Charity, the Little Sisters of the Poor, the Apostolic Carmel, the Sacred Heart Nuns, the Franciscan Missionaries of Mary, the Presentation Nuns, the Salesian Nuns, the Jesus and Mary Nuns, and a large number of local Congregations or societies exclusively recruited from among Indian women. The Protestants have always had a large number of well-trained lay helpers in all their Missions. There are women's colleges conducted by Indian and European societies in the forefront of women's education in India. The Church of England Zenana Mission, founded in 1851, has a fine record of educational and social work. All these devoted and dedicated workers have brought to the service of the poor and the suffering a sense of dedication and love.

Christians were associated with the Indian National Congress from the beginning. There is no doubt that at first a considerable

section of the Christians held aloof. The national movement not only aimed at political emancipation but was also a many-sided cultural Renaissance. This included in many places religious revivals promoted by groups; some of them, like the Ārya Samāj, made no secret of their opposition to the Christian Missions. Some of the missionaries had also provoked criticism by the crudeness of their evangelical methods and the unfair presentation of Indian religion and culture in their publications. There was also suspicion that the mass movements of conversion had been produced in some instances by the promise of material gain. All this made relations between many nationalist leaders and the Christians not very cordial.

It was Mahatma Gandhi who ended this mistrust and swept the Christian community into the national movement. His own indebtedness to the Christian scriptures, his habitual use of the Sermon on the Mount, and the certainty that under his guidance no religious intolerance was to be feared, convinced the Christians that their interests were safe in the hands of the majority community. Indeed the Constitution, when ultimately framed, gave the Christians all the religious and educational guarantees they wanted, including the right "freely to profess, practise, and propagate religion". They, on their part, willingly gave up the claim to separate electorates and reservation of seats. This was a decisive step in the integration of the Christian community with the rest of the nation.

However, all difficulties did not end with Independence and the promulgation of the new Constitution. A problem, which has agitated the minds of the public in the post-Independence period, is that of the presence of foreign missionaries in India. Government, for cultural and economic reasons, have wished to restrict severely the number of visas granted to foreign missionaries. There has been an agitation against missionary work among the Ādivāsīs. On the whole, these difficulties are being overcome through the fair handling of the situation by the Central Government. A limited number of visas, considered necessary for the maintenance of the essential educational and social work of the Christians, are being granted. The appreciation of the good work of Christian Missions, publicly expressed by prominent non-Christian leaders, has helped to reassure the Christian community. No attempt has been made to restrict the religious or cultural activities of the Christians.

Within the Christian community itself certain important movements during this period should be noted. First, a considerable

After Independence

section of the Syrian Christians of Kerala have sought reunion with the See of Rome. This movement was inaugurated by the late Mar Ivanios, who became the first Catholic Archbishop of Trivandrum of the Malankara Rite. The diocese of Tiruvella, also reunited to Rome, is of the same Rite.

Among the Protestants the most significant development is that of unification among several denominations, both in the South and in the North. Two such groups, the United Church of South India, and that of North India, have succeeded in bringing together in some degree of uniformity of religious practice a large number of Protestant denominations. Both these developments are a reflection of the world-wide Ecumenical movement in the Christian world, and have in their turn influenced that wider evolution.

The process of Indianization has been going on at a rapid pace both among the Catholics and the Protestants, and this in a twofold sense. There is the Indianization of the Indianization personnel. The majority of the clergy and the Bishops, both in the Catholic and in the non-Catholic groups, is now Indian and the recruitment of every type of personnel from among Indians is being promoted with vigour. The restriction of visas to foreign missionaries has accelerated this movement.

The other aspect of Indianization is the deeper appreciation of Indian culture in Christian circles and the employment of Indian art in the devotional life of the Church. A type of Church architecture based on Indian styles is being evolved. There is a remarkable school of Indian Christian religious painters, foremost among them being Thomas, Angelo da Fonseca, and Angela de Trinidade. Indian music and dancing are being adapted to Christian themes with success. The Catholic Bishops' Conference has established a special Board for the promotion of a truly Indian Christian religious art. Indian philosophy and devotional literature are being studied with sympathy and understanding by Christian scholars. The Christians of India are becoming conscious of their great cultural heritage and are learning to make the necessary distinction between religion and culture, between doctrine and the artistic expression of religious sentiment.

There are at present 10,528,063 Christians in India; of them, broadly speaking, half are Catholics and the other half members of various Protestant denominations. The The present position Catholics are most numerous in Kerala (where they number over two millions), Tamilnād, Bihār, Madhya Pradesh, Mysore, Mahārāshtra and Gujārāt. They are relatively few in other parts of North India. The Protestants are

better distributed proportionately over the whole of India and their strongest groups are the following: The Church of South India, over a million; the Baptists in Assam, in Bengal, and in Andhra Pradesh, nearly two millions; Lutherans in Andhra Pradesh and in other parts, about half a million; the Marthomites in Kerala, about half a million; the United Church of North India, about half a million. There are over sixty Protestant denominations working in India. In a class by themselves are the half a million Orthodox or Jacobite Syrian Christians. To all these must be added about 100,000 Anglo-Indians, both Protestants and Catholics.

A few details regarding ecclesiastical organization may be added. The Catholic Church has fifteen Metropolitan areas, each presided over by an Archbishop with several suffragan Bishops in the area. These Metropolitan Sees include three of the Syrian Rite, those of Ernākulam, Changanacherry and Trivandrum. The number of Bishoprics is over sixty. There is a permanent Standing Committee of the Bishops' Conference, with a President and Secretary, who, among their other duties, transact official business with Government on behalf of the Hierarchy.

The former Anglican Church is now known as the Church of India, Pākistān, Burma and Ceylon. The Metropolitan resides in Calcutta, and there are 13 Episcopal Sees under him. The Methodist Episcopalians have four presiding Bishops in India. The Metropolitan, or Catholicos, of the Jacobite Syrian Church resides in Kottayam, and has nine Bishops under him. The Mar Thoma Metropolitan, residing in Tiruvella, has four Bishops under him. There are four other independent Bishops of the Syrian Rite in Kerala.

The movement for unification among the non-Episcopalian Protestant groups has been referred to already. The United Church of South India, however, includes not only Methodists, the Presbyterians and the Evangelical Lutherans, but also the South Indian dioceses of the Anglican Church. There are thirteen Bishops in this Church of South India. Eleven Missions of North India, mainly Presbyterian, have joined together to form the United Church of Northern India. The Baptists have four Church Unions, each independent of the others, and the Lutherans are organized in six groups. However, all the Protestant bodies of India have formed a National Christian Council with headquarters in Nāgpur. The Council has no authority in doctrinal or purely ecclesiastical matters, but discusses questions of common interest and deals with Government in official matters, which affect the entire Protestant body.

Already the majority of the priests and pastors in all the Christian communities are Indian. In the Catholic Church there are now about 6,500 ordained priests, both of the secular and the religious or monastic orders. About 5,000 of them are Indians. There are about 20,000 nuns belonging to various Orders and Congregations, and of these over 17,000 are Indians. Of over seventy Archbishops and Bishops, more than two-thirds are Indian. Among the Catholic dignitaries, it is worth noting that there is a Cardinal (Cardinal Gracias of Bombay), and that the Holy See is represented at Delhi by an Internuncio of the status of a Minister; our Minister at Berne is also Minister to the Holy See. Among the Protestants there are 5,000 ordained Indian pastors and clergymen, compared with 3,500 foreigners. In addition to these, both Catholics and Protestants employ a large number of Catechists and other lay helpers in their missions, and almost all of them are Indians.

Of these Indian and foreign missionaries, a certain number is actively engaged in evangelical or conversion work. But the tendency for various reasons is to set apart Indian personnel to this aspect of Mission work and secure the services of the foreigners mainly for educational and social work. It is certain that the movement of conversions to Christianity has not ceased after Independence, though this was expected by many. Christianity is certainly spreading in India, though slowly. Sometimes this happens by the emigration movement of Christian communities, as for instance by the settlement of Kerala Christians in the less populated parts of Malabār and the South Kanara Districts, and the dispersal of Christian labourers from Chota Nāgpur, Tamilnād, and Kerala in the newly developing industrial and mining centres of Central India, and in plantations as far north as Nepāl, and even the Andaman Islands. There are a certain number of converts among educated and professional men, choosing Christianity by personal preference. But most of all there is still a movement of conversions among the Harijans and aborigines.

The numbers of Christians in India—a relatively small item in the vast population of more than 439 millions—do not give an accurate idea of the position of the Christian community in the country. Their impact on the national life of the country as a whole is not to be judged by mere numbers. Their educational and social works are comparatively far above their numerical strength. The majority of the beneficiaries in these educational and social institutions—specially schools, colleges and hospitals—are non-Christians, and they cannot but gain some understanding and appreciation of Christian ideals of service. The knowledge of the Gospel typified by Mahatma Gandhi is widespread, specially

among the educated classes of India. These facts along with the increasing assimilation of Indian culture by the Christians, are completing the process of the integration of the Christian population with the rest of their fellow citizens. That integration has been the chief feature of the history of the Christians in India in recent years. It has enabled the Christians themselves and the other communities of India to become more generally conscious of their place in the diversified pattern of distinct communities that make up the immense population of India, and of their special contribution to the composite culture of their motherland.

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## CHAPTER IX

### SOCIAL STRUCTURE

#### 1. *Unity in Diversity*

THE INDIAN SOCIAL STRUCTURE and cultural pattern are characterized by unity as well as diversity. Historically, India has been hospitable to numerous groups of immigrants from different parts of Asia and Europe, but the culture of each group has undergone enough change over the centuries to become an integral part of the Indian mosaic. The institution of caste may be mentioned as a typical example of the paradox that is Indian society. Each caste stands for a way of life that is to some extent distinctive, but at the same time the castes of a region form part of a single social framework. It is important to note that caste is found not only among the Hindus but also among the Muslims, Christians, Sikhs, Jains and Jews. Caste is ubiquitous, and this has resulted in an ideology tolerant of diversity.

Factors making for diversity are apparent even to the casual observer. The population of India is racially diverse, containing elements from six main racial types: the Negrito, the Proto-Australoid, the Mongoloid, the Mediterranean, the Western Brachycephals, and the Nordic. All the great religions of the world are represented in this country. The tribal groups enjoy varying degrees of contact with one or the other of the great religions. The major literary languages alone number fourteen. Diversity is seen in the patterns of rural as well as urban settlements, community life, forms of land tenure and agricultural operations. In kinship, marriage rites and customs, inheritance, and the general mode of living, there are striking differences between groups.

Diversity is, however, only one side of the picture. There are unifying factors as well. India is a political entity, every part of which is under the same Constitution. The process of unification developed as several great rulers—Aśoka, Samudragupta, Akbar—brought large parts of the country under their power; but it was only during British rule that India became for the first time a single political entity.

The concept of the unity of India is inherent in Hinduism. There are sacred centres of Hindu pilgrimage in every corner of the land. Certain salient aspects of Sanskritic culture are to be

found all over the country. India is the sacred land not only of the Hindus but also of the Sikhs, Jains and Buddhists. The Muslims and Christians, too, have several sacred centres of pilgrimage in India. The institution of caste cuts across diverse religious groups and gives them all a common social idiom.

The declaration of India as a secular State provides one more evidence of the tolerance of diversity which has been characteristic of Indian history from its beginning. The process of economic development ushered in by the Five Year Plans and the spread of egalitarian ideals have brought about revolutionary changes in the Indian pattern of social life. A single government and a common body of civil and criminal laws, a developing economy, and a secular approach to public life and problems are now providing substance and reality to India's claim to be a nation.\*

## 2. *Structure of Indian Society*

### *Caste*

The first literary traces of the caste system are to be found in the *Rg-Veda*, where three groups are mentioned: *Brāhma* (Priests), *Kṣātra* (Kings or Rulers), and *Viś* (common people). The *Puruṣasūkta* hymn, however, speaks of four classes originating from four parts of the body of the creator. These classes, *Brāhmaṇa*, *Rājanya*, *Vaiśya* and *Śūdra*, are referred to in later literature as *Catur-varṇa*. The term *varṇa* does not seem to have been applied to these classes in the earliest literature, except to contrast the fair *Ārya* with the dark *Dāsa*. The initial distinction of people into two *varṇas* later developed into three (*Brāhma*, *Kṣātra* and *Viś*) and finally into four. The occupations of the first two *varṇas* are clearly stated to be priesthood, and administrative and military duties respectively. But the duties of the *Vaiśya* and *Śūdra* are not very clear. The village headman was usually a *Vaiśya*, and *Śūdras* were servants. The *varṇa* categories do not, however, exhaust the various occupations practised in Vedic India. The *Rg-Veda*, for instance, mentions several occupations by name—chariot-builder, goldsmith, barber, physician, leather-worker, potter, merchant and others. The question arises whether these occupations referred to endogamous *jātis* as we know them today. It

\*The author is obliged to Dr. M.S.A. Rao for general help and criticism, and to Shri B. Shivaramiah for suggestions on the parts dealing with recent changes in law.

is not known how they fitted into the *varṇa* framework. The post-Vedic period saw the growth and consolidation of the power of the Brahmins. Brahmin writers continually discussed and defined the duties and rights of each caste and its place in the hierarchy. (The relation which these writings bore to the empirical reality is not clear.) Justifications and rationalizations of the hierarchy were also produced during this period. In the *Bhagavad-Gītā*, for instance, the caste system is sought to be justified on the basis of the ideas of *guṇa*, *karma* and *dharma*.

The 6th century B.C. saw the rise of Buddhism, which is believed to have questioned the basis of the caste system itself. Some scholars, however, have said that Buddhism on its social and political side was chiefly a Kṣatriya movement against Brahminical supremacy.

Post-Vedic Brahminical writers continued their attempts to systematize and codify inter-caste relations. The idea of pollution was elaborated to define the distance separating the castes. Violations of caste rules were punished either by the village panchāyat or the panchāyat of the locally dominant caste or by the king.

The Bhakti movement with its long history contained elements which ran counter to caste ideology. The Bhakti saints came from all castes, including the Harijans. It appears as though the path of *Bhakti* offered a way out of the tyrannies of the caste system, and as the Bhakti saints commanded respect from every one, the movement itself served to stress the worth of an individual irrespective of his caste affiliations. The origins of the Bhakti movement are traced to the Kṛṣṇa-Vāsudeva cult in the first century B.C. The Śaiva (Nāyanār) and Vaiṣṇava (Ālvār) saints of the Tamil country, the Haridāsas and Lingāyat saints of Karnātaka, Vallabhācārya and his followers in Gujarāt, Caitanya in Bengal, and Tulasīdās, Sūrdās, Kabīr and Rāmānand in the North, were all representatives of the Bhakti movement. The movement was more or less continuous in Indian history, and it spread right across the subcontinent. It may not be too fanciful to regard it as a protest in the realm of religion against the division of human beings into high and low castes.

The Lingāyat movement which came into existence in Karnātaka in the 12th century A.D. rejected many ideas of traditional Hinduism, including karma, ritualism and caste. It also emphasized the necessity as well as the dignity of labour. The movement attracted converts from all castes including Harijans, but over the centuries it became a congeries of small, endogamous *jātis*. The followers of Kabīr (Kabīrpanthi) also became a caste.

Caste even survived conversion to Christianity and Islām. During the last century there came into existence the Ārya Samāj in the Punjab and the Brāhma Samāj in Bengal. These movements, as well as the Ramakrishna Mission, represented a shift towards the liberalization of caste.

We shall now consider the main features of caste before it was deeply affected by recent changes. Those changes, which present a quite different picture of the Indian social structure today, are discussed in the last pages of this chapter.

The features of caste prevailing through the past centuries may be described under nine heads; hierarchy; endogamy and hypergamy; occupational association; restriction on food, drink and smoking; distinction in custom, dress and speech; pollution; ritual and other privileges and disabilities; caste organization; and caste mobility.

The essence of caste is the arrangement of hereditary groups in a hierarchy. The popular impression of the hierarchy is a clear-cut one, derived from the idea of *varṇa*, with Hierarchy Brahmins at the top and Harijans at the bottom.

But, as a matter of fact, only the two opposite ends of the hierarchy are relatively fixed; in between, and especially in the middle regions, there is considerable room for debate regarding mutual position. In a dispute over rank each caste would cite as evidence of its superiority the items of its dietary, the other caste groups from which it accepted or refused to accept cooked food and water, the ritual it performed and the customs it observed, its traditional privileges and disabilities, and the myth of its origin. The fact that mutual position is arguable if not vague over great areas of the hierarchy permits social mobility. Mobility, it may be noted, is not a recent phenomenon. Even in the traditional system it was possible for a caste to move up. The Rāj Gonds of Central India, for instance, successfully claimed for themselves the rank of Kṣatriyas on the basis of their acquisition of political power. At the coronation of Śivājī, Brahmin priests declared him a Kṣatriya. Not infrequently, the claim of a caste to a higher rank is not conceded. Thus, the Smith group of castes in South India have claimed to be a twice-born caste and call themselves Viśvakarmā Brahmin. The other castes resent this and even the Harijans do not accept drinking water from a Smith. The Liṅgāyats consider themselves superior to the Brahmins but others do not accept their claim.

Disputes regarding mutual position occur even at either extremes of the hierarchy. In Kerala, Nambutris consider themselves superior to Tamil Brahmins, and among the Nambutris

those who have a hereditary right to study the Vedas claim superiority over the others. Again, there are very low groups among the Brahmins. No caste, including the Harijan, will accept cooked food or water from the Mārka Brahmins of Mysore. Likewise, the Vātima Brahmins in the Tamil country and the Tapodhan Brahmins in Gujarāt are considered as inferior.

All Caste Hindus regard Harijans as being at the bottom rung of the ladder. But the category of Harijans is not homogeneous. In each linguistic area there are a few Harijan castes which form a hierarchy. The leather-working Camār in Uttar Pradesh considers himself superior to the Bhaṅgī, a sweeper. The Kannada Holeyā places himself above the Mādiga; he proudly stresses the fact that he does not accept even water or betel leaf from either the Smith or the Mārka Brahmin.

Islām proclaims the idea of equality of all those who profess the faith, but in India it has been characterized by caste. Muslim caste differs in some respects from the Hindu caste system; there are no ethico-religious ideas justifying the hierarchy or regulating inter-caste relations through ideas of purity and pollution; there are no *varna* categories. What we have is a hierarchy formed by several *jātis*.

In Uttar Pradesh, Muslims who have a tradition of foreign ancestry (Irān, Arabia) are called Shurafa or Ashraf and are considered to be the highest. After them come converts from high-caste Hindus, such as Rājputs. Next come occupational castes such as the Weaver (Julāhā), Barber (Nāi), Cotton Carder (Dhuniyā), Potter (Kumhār) and Oilman (Teli). Last come the Sweepers. Among the Ashraf, the Syeds rank as the highest.

The Moplah (Māppilla) Muslims of Kerala are also divided into castes. The Thangals, claiming descent from the Prophet's daughter, Fāṭima, are at the top; next to them are the Arabs, descendants of immigrants from Arabia. The Pusālars, said to be recent converts from the Fisherman caste, occupy the third position while the Ossans, who are barbers, are at the bottom.

Equality is a tenet of Sikhism also, but that has not prevented the existence of castes, including Brahmins, among Sikhs. Sikhs are broadly divided into Sardārs and Mazhabis, the former consisting of high castes and the latter of Sweepers. The Sardārs include Jāṭ and Kamboh (landowners), Tarkhān (Carpenter), Kumhār (Potter), Mehra (Water-carrier), and Cimba (Washerman). The first two castes regard themselves as superior to the others. The Mazhabi not only came from a low caste but were converted to Sikhism later than the higher caste groups. In some parts of Punjab

there exist the Sānsi (Shepherd) who were formerly included among the "Criminal Tribes"; Sānsi converts to Sikhism rank even lower than Mazhabis.

There are three divisions among Indian Jews : Beni-Israel, Cochin Jews and Baghdādi Jews. The Beni-Israel are to be found principally in Bombay. They are divided into groups, *Gorā* (White) and *Kālā* (Black), the former being considered higher in rank. The Cochin Jews are divided into similar White and Black groups, and there is a third division called Meshuraram comprising the descendants of Cochin Jews and their slave concubines ; the Meshuraram who are descended from a White Cochin Jew claim superiority over those descended from a Black Cochin Jew. The third Jewish group, the Baghdādi, are later immigrants, and are found in Bombay and Calcutta.

Caste divisions occur among Indian Christians, Catholics as well as Protestants. The Syrian Christians of Kerala, the earliest converts to Christianity in India, claim to have been recruited originally from Nambutri Brahmins and Nayars, and caste distinctions are conspicuous among them. Caste restrictions are rigidly observed among the Christians of the West Coast. A Catholic Brahmin from Mahārāshtra would marry none other than a Catholic Brahmin. Some West Coast Christians have migrated to East Africa and their descendants try to marry within their particular subcaste.

Conversion does, however, weaken pollution ideas, and social life among Christian converts is more free than among Hindus. Again, all over India, caste restrictions are far less meticulously observed today than they were a few decades ago. Social institutions are changing, and this affects all social groups, though in varying degrees.

The hereditary association of a caste with an occupation has been so striking that it has occasionally been argued that caste is nothing more than the systematization of occupational differentiation. Even though a caste is not only associated with an occupation but has a limited kind of monopoly over it, it is not true to say that every member of the caste practises that occupation exclusively. This kind of association is suggested when, for instance, the term Kumhār is translated as Potter, and Dhobi as Washerman. But, generally speaking, most castes also practise agriculture in addition to their traditional occupation. A Kumhār may be an agriculturist in the monsoon months, and a trader in grain for a brief period after the harvest. Often, the artisan and servicing castes do not have an adequate income from their traditional occupations and

they therefore work on land, either as tenants or as casual labourers. It could be argued that, in the context of a growing population, the occupational aspect of the caste system would have broken down completely if the surplus in the artisan, trading and servicing castes had not been either absorbed in agriculture or able to migrate to other areas.

Traditionally, agriculture (used broadly to include even mere landownership) was a common occupation for all castes. The profession of arms was also practised occasionally by the non-Kṣatriya castes, including Brahmins and the locally dominant peasant groups.

To associate a caste invariably with a single occupation is an oversimplification. Even "agriculture" can mean a variety of things: landownership, tenancy and labour. Each may be practised exclusively or in combination with the others. Sometimes cultivation includes processing the grown crop into a saleable commodity. Thus the cultivation of sugar-cane, except when grown for a factory, includes the processing of cane into jaggery and its sale to a middleman. Again, different members of a family may have different occupations. All women cook and they may also take some part in agriculture. Women of the artisan castes may in addition participate in the caste craft.

Occupations are also classified into high and low, those practised by the high castes being regarded as high. Manual labour is looked upon as low, and certain occupations like swine-herding and butchery are considered to be polluting.

Among Muslims, only artisan castes such as the Teli, Darzi, and Julāhā are associated with traditional occupations. Priests tend to come more from the Syed and Shaikh castes than from the others. Among the Sikhs, the traditional occupation is often practised along with agriculture. Jāts are generally landowners, while the Mazhabis are agricultural labourers. Sikh Tarkhāns are carpenters. An occupation which is indispensable everywhere except among the Sikhs is hair-cutting. But the Sikh Nāi renders other services: he clips the nails of his patrons; he carries news of birth, marriage and death. He is also a *masseur*.

An individual in a caste society lives in a hierarchical world. It is not only the people who are divided into higher and lower groups, but also the food they eat, the dress and ornaments they wear, and the customs and manners they practise. In India's dietetic hierarchy the highest castes are usually vegetarians and teetotallers. Even in meat there is a hierarchy. The highest non-vegetarian castes eschew chicken, pork and beef. Wild pork is superior to domestic

pork, since the village pig is a scavenger. Eating beef in rural India means eating carrion and it comes accordingly under a double ban. Liquor is prohibited to the high castes.

Elaborate rules govern the acceptance of cooked food and water from another caste. Food cooked with ghee, milk or butter is called *pakkā* food and may be accepted from inferior castes. (Higher castes buy sweets from the *Halwāī* because he is supposed to be cooking them with ghee.) *Kaccā* food, on the other hand, is food cooked with water and it may be accepted normally only from one's own or equivalent or superior castes. When two castes are contending for superiority, they stop accepting cooked food and water from each other. Sometimes, a very low caste refuses cooked food or water from a high caste. We have already mentioned the instance of the Kannada Holeyā. The explanation of these usages lies in the history of inter-caste relations in the area in question, and in particular, in the attempts of individual castes to raise themselves up.

There are exceptions to the general restrictions on the acceptance of food and water. Food or drink which has been sanctified by being offered to a deity in a temple may not be refused, even though the cook is from a low caste. (The cooks in the famous Jagannāth temple at Puri are Barbers by caste.) Significant regional variations also occur. Further, women tend to observe restrictions more strictly than men, and the old more strictly than the young. Among the highly Westernized sections in the big cities, such restrictions are minimal.

In North India, *hukkā* smoking offers an index of caste-status. Castes which may share, on occasions, a single *hukkā* are equals. Thus Jāts and Ahīrs may smoke from the same *hukkā*. Sometimes the Lohār (Blacksmith) and Khātī (Carpenter) are allowed to smoke from the same *hukkā* as the Jāt and Ahīr. The Nāis (Barber), like many other castes, have their own *hukkā*.

Muslim castes freely accept cooked food and water from one another. Such restrictions regarding food and drink as obtained among Muslims are common to them all. As for the Sikhs, Sardārs have reservations about *kaccā* food cooked by Mazhabis, but accept liquor brewed by them.

Each caste has a culture which is to some extent autonomous: there are differences in dress, speech, manners, ritual and ways of life. The higher castes wear fine clothes and gold ornaments while the lower castes wear coarse material and silver ornaments. The speech of the higher castes is refined while that of the lower castes is rugged. Traditionally, the lower castes were prohibited from taking on the

Customs, Dress  
and Speech

dress, ornaments and customs of the higher, and the offenders were punished by the village panchāyat.

The concept of pollution plays a crucial part in maintaining the required distance between different castes. A high caste man may not touch a low caste man, let alone accept cooked food and water from him. Where the two castes involved belong to either extreme of the hierarchy, the lower caste man may be required to keep a minimum distance between himself and the high caste man. In Kerala a Nāyādi had to keep 22 m. away from a Nambutri and 13 m. from a Tiyan, who himself had to keep 10 m. away from a Nambutri. A few decades ago, in most areas of South India, there were rules which laid down what parts of a high caste man's house the others could enter. The rules of pollution, at least so far as inter-caste relations were concerned, were more clearly elaborated in South than in North India.

There is a broad line between Caste Hindus and Harijans in the matter of pollution. The village barber and washerman will not serve Harijans, and the latter have to provide for these services from among themselves. Harijans have to take water from a lower end of a river or canal than the high castes and they may not use the Caste Hindu well.

The breaking of pollution rules results in the higher castes becoming "impure", and the latter have to perform certain purificatory rites to regain their normal status. Where the breach of the rule is serious, as when a high caste person eats food cooked by a Harijan or a high caste woman has sex relations with a Harijan, the offender may be thrown out of caste irrevocably.

The idea of pollution is present among the Sikhs. The Mazhabis have a well of their own everywhere, and in rural areas they may not be allowed to enter the houses of Sikh high castes beyond the cattle-yard.

The culture of each caste is to some extent peculiar to itself, and this is related to the fact that the lower castes are barred, at least in theory, from taking over the customs and rituals of the higher castes. Only the "twice-born" castes are entitled to study the Vedas and perform rituals in which Vedic mantras are chanted. Traditionally, the Brahmin was exempt from capital punishment and his land was assessed at a lower rate. These restrictions and disabilities operate fully against the Harijans —they may not use Caste Hindu wells or enter temples and tea-shops. In some parts of the country they were prohibited from entering the high caste streets. The high castes also kept away from the Harijan ward of the village.

Among the Sikhs, Mazhabī wedding parties are not accommodated in gurdwāras as they are regarded as impure. Among Muslims, however, lower caste groups are not subjected to disabilities. The Christians on the west coast of India observe caste restrictions: there are separate pews for the Brahmins and the Harijans in some churches, and very rarely, even a separate church for the Harijans.

Villagers are subject to the twofold control of caste and village panchāyats. (Caste panchāyats, however, are not well developed among Brahmins.) When the disputes Caste organization concern law and order in the village—for example, setting fire to someone's hayrick, grazing cattle on another's land, stealing fuel or vegetable—it is reported to village elders who may levy a fine on the offender or subject him to corporal punishment or declare a boycott against him. In a marital dispute the council of the concerned caste is the proper body to adjudicate. But the village council may take a hand in the dispute. Where a man is accused of having sex or commensal relations with a member of a lower caste, his own caste or the council of the locally dominant caste, or the village council might be called upon to adjudicate. Punishment may include a fine, temporary outcasting and fine, or permanent outcasting. Readmission to caste requires that the offender undergo purificatory ritual, express his regret to the caste assembly, and give a dinner to the caste. Occasionally an offender may be readmitted to caste after having been outcasted for a decade or two.

Many Muslim castes, excepting the Ashraf and Shaikh, have councils like Hindu castes. Generally, a caste council deals with all questions concerning trade, morals and religion. Sometimes a caste may not permit its members to take up an occupation considered less honourable than its traditional one.

We have given a brief description of the general features of the caste system and we shall now show how it actually functions Caste in the in the context of the village community. Inter-caste village community relations at the village level constitute "vertical" ties. They may be classified into economic, ritual, political and civic ties.

The castes living in a village, or a group of neighbouring villages, are bound together by economic ties. Generally, peasant castes are numerically preponderant in villages and Economic ties they need the Carpenter, Blacksmith and Leather-worker castes to perform agricultural work. Servicing castes such as Priest (Brahmin as well as non-Brahmin), Barber, Washerman and Water-carrier cater to the needs of

everyone except Harijans. Artisan castes produce goods which are wanted by everyone. Most Indian villages do not have more than a few of the essential castes and depend on neighbouring villages for certain services, skills and goods.

In rural India, with its largely subsistence, and not fully monetized economy, the relationship between the different caste groups in a village takes a particular form. The Jajmāni system essential artisan and servicing castes are paid annually in grain at harvest. In some parts of India, the artisans and servicing castes are also provided with free food, clothing, fodder and a residential site. On such occasions as birth, marriage and death, these castes perform extra duties for which they are paid a customary sum of money and some gifts in kind. This type of relationship is found all over India and is called by different names : *jajmāni* in the North, *bārā balūte* in Mahārāshtra, *mirāsi* in Madras and *adade* in Mysore. The relationship between a *jajmān* and his *kamin* is unequal, since the latter is regarded as inferior. Though primarily an economic or ritual tie, it has a tendency to spread to other fields and become a patron-client relationship. The relationship is generally stable, and usually inherited. The right to serve is hereditary, transferable, saleable, mortgageable and partible. Thus, for instance, the right to officiate as priest to high castes living in some sixty villages in the Mysore District is shared among the different branches of a single Brahmin lineage in Bannūr.

The *jajmāni* system bound together the different castes living in a village or a group of neighbouring villages. The castewise division of labour and the consequent linking up of different castes in enduring and pervasive relationships provided a pattern of alliances which cut across the ties of caste. The modern "caste problem" is to some extent the result of the weakening, in the last fifty years or more, of these vertical and local ties and the consequent strengthening of horizontal ties over wide areas.

Caste was related to the exercise of differential rights in land. At the top were the castes who were either absentee or non-cultivating owners. Next came the cultivating tenants (not infrequently owning a little land as well), and at the bottom of the hierarchy came the landless labourers. There was regional variation in this matter. Kerala, for instance, had a chain of intermediaries between the owner and the actual cultivator. There was more or less perfect congruence between caste hierarchy and differential rights in land in Kerala. At the top of the hierarchy were the Nambutri Brahmins who were

non-cultivating owners (*jenmi*). The "high" Nāyar castes were the non-cultivating lessees of Nambutri land on twelve-year leases (*kānam*). The agricultural labourers, both tied and free, came from the lower castes like Cerumān and Pulayan and from the Pānan tribes. In Punjab, however, there was a lack of coherence between the agricultural and caste hierarchies, Brahmins being the cultivating tenants of Jāṭ landowners. But, in both areas, agricultural labourers come from the Harijan castes. In some parts of Punjab and Uttar Pradesh, only a few castes showed a direct concern with land and agriculture, the owner-cultivators being either Jāṭs, Ahīrs and Rājputs (Thākurs) or Gūjars, while the agricultural labourers were mostly Camārs.

The existence of a high degree of congruence between caste and agricultural hierarchy meant that the stratification ran deep: economic stratification strengthened ritual stratification and vice versa. This enabled the landowners to exploit the tenants as much as they could—rack-renting, eviction and forced labour were usual features of rural life. But where the tenants' caste was higher than that of the landowner, and particularly when a tenant was also the landowner's priest (as was sometimes the case with the Brahmin tenant of a Rājput landowner) exploitation had to be much less extreme.

In pre-British India, in many parts of the country, the lower castes were serfs or slaves, either attached to the land and liable to be transferred along with it, or attached to the landowner and liable to be sold by him. The economic forces released under British rule (e.g., the starting of tea and coffee plantations, and of factories and railways) enabled the law abolishing slavery to be translated into reality. But even now the agricultural hierarchy is mixed up in different ways and degrees with the caste hierarchy in several parts of India.

The relationship between master and servant is another type of bond which often cuts across caste, and more rarely, even religion. The terms and conditions of this bond vary from region to region. A common form is the advance by the master of a loan which is worked off by the servant in the course of two or three years in the master's house. Frequently, before the expiry of the period, the servant takes another loan which results in prolonging his servitude. It is not unusual to come across families linked with each other for generations by ties of master and servant. In some parts of the country, like Mysore, there was until recently a traditional bond as of master and servant between the landowning castes and the local Harijans. The obligations involved were

Master and  
servant

only a few duties on occasions such as marriage and death. The payments were also traditionally fixed.

The relationship between landowner and tenant, master and servant, creditor and debtor, may all be subsumed under a single category—patron and client. This relationship is widespread and crucial to the understanding of rural India. Voting at elections, local and general, is influenced by the patron-client tie.

Ritual occasions, e.g., life-cycle ceremonies, festivals and fairs, require the co-operation of several castes. Life-cycle ceremonies are somewhat more elaborate for the "twice-born", especially the Brahmin castes. Certain rituals which are common for all the castes occur at birth, a girl's puberty, marriage and death. Thus

when a son is born to an Ahir or Thākur, a Bhaksorin (Harijan) woman helps in the delivery and a Bhangī beats a drum before the house in which the birth occurred. A Brahmin casts a horoscope while the village barber acts as a messenger and also serves food at the feast. These services are paid for by gifts in cash as well as kind. In Kerala, the Washerwoman gives freshly-washed clothes to her high caste patrons after the termination of birth, menstrual and death pollution. In rural Mysore there is a saying that eighteen castes have to come together at a wedding: the Harijan servants cut the wood, whitewash the house and clean the grain; the Barber not only shaves the groom but provides the wedding band; the Washerman supplies the washed cloth for the bridal pair to walk on; the Potter provides the utensils and ritual pots; the Carpenter puts up the wedding *pandal*; the Goldsmith makes the ornaments; the Oilman supplies the oil; the Brahmin acts as priest; the dancing girl threads the *tāli*; the Trader supplies several articles; the Shepherd provides a woollen thread which is tied as *kankan* round the wrists of the bridal pair, and so on.

Several castes are also required to co-operate in the performance of calendrical festivals, and festivals of village deities. In the case of the latter, the castes may come from more than one village. Thus, Banas from Malabar dance at the festivals of some Coorg village deities. The festival of a village deity always involves the co-operation of several castes, and frequently a few of these castes come from neighbouring villages.

The temple organization itself needs the coming together of several castes. In Kerala, for instance, the head priest of a Sanskritic, vegetarian and teetotal deity is a Nambutri Brahmin. A few Nayār castes have the task of washing the vessels and cleaning the temple. The Ambalavāsis perform a variety of tasks and they make garlands, assist the chief priest, provide music.

There is a caste of story-tellers attached to the temple. In temples to non-vegetarian deities, a member of the Piḍārār caste is the priest. Low caste dancers get possessed by the deities, and sing and dance in that state.

It may be taken as axiomatic that all the local castes are involved in the festival of a village deity. Even the Harijans have important duties, such as beating the drum, carrying messages, and removing the leaves on which the villagers have dined.

In many parts of India, villagers believe (or at least believed until recently) that the goddesses Mārī, Kālī and Sītalā presided over epidemic diseases such as smallpox, plague and cholera. An outbreak of one of these diseases was attributed to the wrath of the village goddesses and their propitiation followed. The priest was usually a member of a non-Brahmin caste, and occasionally even a Harijan. Members of all castes including the Brahmin sent their contributions in cash as well as in kind to the ritual propitiation. The fact that occasionally a Harijan or other low caste priest catered to the religious needs of all, including the highest castes, affected the quality of inter-caste relations.

Sometimes the ties of ritual stretch even across religious cleavages. A Sikh farmer may go to a Brahmin priest to find out an auspicious hour for starting ploughing operations. Until forty years ago, Brahmin priests officiated at life-cycle ritual in Sikh homes. In recent years the Akālī Movement has enjoined religious self-sufficiency on the Sikhs, and the Sikh Granthī is increasingly acting as priest at Sikh weddings. The Sikh priest may come from any caste except Mazhabi. Sikhs and Hindus attend festivals in honour of Pirs (Muslim saints). In Mysore a Muslim peasant may vow to Mādēśvara that he will give a money-offering if his cow calves, or if it is cured of a disease. However, the tendency to religious and even sectarian self-sufficiency has gained strength in recent years.

The functioning of the village as a political and social entity brought together members from different castes. First, there was the traditional village panchāyat which, though run by the locally dominant caste, usually included a few representatives from the other castes. The available historical evidence points to the existence of vigorous communities in South India in the panchāyats of which members of every caste took part.

Every village had a headman usually belonging to the dominant caste. The accountant was always a Brahmin in South India. Every village had a watchman and messengers and town-criers. In irrigated areas, there was always a man to look after

and regulate the flow of water in the canals feeding the fields. The headman and accountant collected the land taxes with the aid of the Harijan village servants.

The village council performed a variety of tasks, including the maintenance of law and order, settling of disputes, celebration of festivals and construction of roads, bridges and tanks.

In many parts of rural India there exist castes which are locally numerically preponderant, own the bulk of the arable land, occupy a fairly high position in the ritual hierarchy, Dominant caste and wield power over the other castes. Examples and village councils of such castes are Jāts, Ahirs and Rājputs in the North, Pātidārs in Central Gujarāt, Marāthās in Mahārāshtra, Kamma and Reddi in Andhra Pradesh, Liṅgāyat and Okkaliya (Vakkaliga) in Mysore, Vellāla and Gounder in Madras and Nāyar in Kerala. Sometimes the dominance of a caste is decisive, all types of power being concentrated in it. At other times, however, the different elements of dominance may be distributed among several castes. In the first instance, the dominant caste wields great power over the others, while in the second there is likely to be a balance of power among the powerful castes. It should be noted in this connection that the maintenance of law and order in rural areas even now depends to some extent upon the leaders of the dominant caste. They are the people who can punish errant individuals and ensure the maintenance of the caste codes. When a caste is politically or economically dominant, its religious position tends to fall in line with its secular position.

The Sikhs as a whole are dominant in many parts of Punjab and Sikh Jāts are dominant among the Sikhs. Similarly, in parts of Kerala, the Syrian Christians and Moplahs are dominant. In Malīhābād Tahsil in the Lucknow District there are villages in which Pathāns are dominant.

The village community consisted of hierarchical groups, each with its own rights, duties and privileges. The castes at the top had power and privileges which were denied to the lower castes. The lower castes were tenants, servants, landless labourers, debtors and clients of the higher castes. There was competition among the former to be clients of the rich and powerful patrons while the latter wanted to have as many clients as possible. The patrons had duties towards clients and vice versa. The caste system together with the inequalities of landownership produced a deeply stratified society, but that did not prevent the village from functioning as a community. Conflict and co-operation went together. There

Inter-caste  
conflicts in  
villages

was economic conflict between masters and servants, landowners and tenants, and competition between members of the same caste. The struggle for higher status between structurally neighbouring castes also produced conflict. And in recent years the lower castes have shown an increasing desire to free themselves from the control of the locally dominant caste. This has been assisted by political forces operating from higher levels.

### *Religious Groups*

The 1931 Census classifies Indian population under ten religious groups. They are Hindus, Sikhs, Jains, Buddhists, Zoroastrians, Muslims, Christians, Jews and Other Religions (Tribal), and Other Religions (Non-Tribal). The designation of tribal religion as separate from Hinduism (except where a tribe had been converted to Christianity or Islām) was unsatisfactory. A study of the religion of the different castes and tribes will show the presence of elements from different layers of Hinduism, from the Sanskritic to the tribal, mixed in different proportions; and it is arbitrary to draw a sharp line between Hinduism and tribal religion. It is difficult to separate the religion of castes at the bottom rung of the hierarchy from the religion of the tribes. The former contains many tribal elements just as the latter contains many "Hindu" elements. Thus the Santāls observe several high caste festivals; Bhagwān is the supreme deity of the Bhils; the Solagas of Mysore worship Ranganātha in the Biligiri hills; and the Todas and Badagas of the Nilgiris worship Siva in Nanjangūd. Different tribes are Sanskritized in different degrees, and different sections of the same tribe may not be uniformly Sanskritized. Thus, the Khonds of Khondmāls are less Sanskritized than Khonds in Puri who resemble an Oriyā caste in their religious life. These remarks should be borne in mind while reading the census data given below.

Table I on p. 517 gives the varying figures for the growth and decline of each religious group over a period of 30 years (1921-51) for the present territory of India.

The highest increases have been experienced by the Hindus, Christians and Sikhs. The decline in the number of the followers of tribal religions may be attributed to their inclusion in one or the other of the advanced religions. The decline in the number of Muslims and the increase in the number of Sikhs are both due to the partition of the subcontinent into India and Pākistān and the immigration of Sikhs into India.

TABLE I  
*Number per 10,000 population by religion (1951)*

Religion	1921	1931	1951	Net variation (1921-51)
Hindus	8,440	8,434	8,689	+249
Sikhs	37	46	77	+40
Jains	51	50	52	+1
Buddhists	5	4	3	-2
Zoroastrians	5	4	3	-2
Muslims	957	986	909	-48
Christians	179	211	235	+56
Jews	..	..	..	..
Other Religions (Tribal)	326	265	32	-294
Other Religions (Non-Tribal)	..	..	..	..
All Religions	10,000	10,000	10,000	

*Note:*—The figures do not include the population of each religion in the three States of Assam, West Bengal and Punjab.

The 1961 Census\* has, however, removed the anomalies described above. It classifies Indian population under seven religious groups: Hindus (366,526,866), Muslims (46,940,799), Christians (10,728,086), Sikhs (7,845,915), Buddhists (3,256,036), Jains (2,027,281), Other Religions and Persuasion (1,611,935).

A proper explanation of the differential rates of growth of various religious groups can only be made after a religionwise study of the birth and death rates, and of migration and other factors. But a detailed discussion of the demography of religious groups is outside our scope. One factor which has been significant in the growth of some of the largest religious groups in this country is conversion. According to the Census Report of 1931, "The increase under the head of Christian is of course largely due to conversion which causes a steady transfer to Christianity from the depressed classes and still more, except in Madras, from the hill and forest tribes. If the natural increase be 12%, then over 20% of the total increase of 32·5% must be due to conversion." There are similar remarks about the sizeable (33·9%) increase in the number of Sikhs. The Census Report of 1931 also states that some Muslims and Christians, but not a large number, have been reconverted to Hinduism. The increase in the number of Christians and Sikhs is complementary to the decrease in the number of people under Tribal Religions. The Census Report again comments that the decrease in the percentage of tribal people is primarily due to losses by conversion to Hinduism or Christianity.

\* Religious break-up of 297,853 persons in the NEFA is not available; includes figures of Sikkim.

A similar remark is made in the 1951 Census Report. (It is more likely that nowadays many tribals declare themselves as Hindus.) In the last few years, thousands of Harijans in Mahārāshtra became converted to Buddhism.

Before describing the role of religious groups in Indian social structure, we shall consider the relation between religion and rural-urban residence, and literacy and occupational affiliation. According to the 1931 and 1941 Censuses, the tribal people were predominantly rural. The relative urban percentage of Muslims, Christians and Jains was higher than their rural percentage. Pārsis and Jews were mainly urban while Jains, Sikhs and tribals were minimally urban.

Again, religious groups were least urbanized in the Provinces where they were numerically preponderant. Even Pārsis were less urbanized in Bombay than in other places. Conversely, religious groups were most urbanized in provinces where they were least represented. Another point worthy of note is that migration was generally to urban areas and not from one village to another. This may, however, be due to the fact that inter-village migration is more difficult to trace than migration to towns.

Kingsley Davis has said that on the basis of census figures for the period 1891-1931 for persons aged ten and above, Pārsis show the highest percentage of literacy. Jains, Jews and Christians follow in order. It is pointed out in the Census of India, 1931, that the high literacy rate for Pārsis and Jews is due to their activity in trade, which requires literacy. This explanation is perhaps too simple. It does not explain why Christians, who as a body are not active in trade, show a high literacy rate.

TABLE II  
*Literate number per 100 of each main religion*

	Muslim	Hindu	Sikh	Christian	Jain	Pārsi
1891	4·2	6·3	6·8	26·5	32·6	66·2
1901	4·4	6·5	7·5	26·6	30·9	76·2
1911	5·2	7·3	8·8	28·5	34·8	82·7
1921	6·2	8·6	8·0	31·7	37·8	83·7
1931	7·2	9·3	10·2	30·5	38·2	83·0

From the above table it is seen that minority religions show a greater percentage of literacy than the majority religions. Again, the fact of being in a majority in an area seems to work against

a high literacy figure. Thus, Muslim males in the former Central Provinces and Berār, an area in which Hindus were in a majority, had the highest percentage of literates while, in the North-West Frontier Province and Baluchistān, which were predominantly Muslim, there was the lowest number of literates.

In his book *Hinduism and Economic Growth* (Bombay, 1962), Dr. Vikas Mishra has made a study of the occupational pattern of the different religious groups in India. He concludes that the occupational distribution of the Pārsis, Jews and Jains is "advanced" though not diversified. Hindus and Muslims have a diversified occupational pattern while the tribals' pattern is neither advanced nor diversified.

Dr. Mishra's analysis points to the conclusion that minority religions are advantageously situated as far as occupational distribution is concerned. It is likely, however, that there are differences between one region of India and another. Syrian Christians, for instance, show a more "advanced" pattern in Travancore than in North Kerala. Similarly, Moplahs in North Kerala are more advanced than their co-religionists in South and Central Kerala. This is perhaps related to the fact that in North Kerala the Moplahs formerly wielded political power.

On the whole, minority religions have fared better in the economic field, and especially commerce. Caste seems to be of crucial significance in this connection. Where there was no local trading caste, a minority religious group seems to have stepped in to fill the breach. The Moplahs have, for instance, played an important role in Kerala commerce.

In the case of Christians, especially recent converts, conversion has been followed by intensive efforts to educate the converts and to find employment for them. The money and political influence commanded by the foreign missions enabled them to provide employment for the converts in a variety of occupations.

We shall now consider the role of religious groups in the social structure, the latter term being used broadly to include also the economic and political structure. This topic

Role of religious groups

may be discussed under the three following heads:

(i) The relations between different castes and religious groups at the village and other local levels; (ii) the general role of religion in the economic development of the country; and (iii) religion and socio-economic privileges.

Though villages embracing multireligious groups are not as common as multicaste villages, they are not infrequent. Such villages are not confined to any one part of India, but are found everywhere. There are villages with Hindu tenants and Muslim

landlords (Uttar Pradesh), and Hindu landlords and Muslim tenants. Rāmpura village in Mysore, for instance, was dominated by Kannada-speaking, Okkaligas (Hindu peasant caste) who owned the bulk of the land. There were also many landowners from other Hindu castes (from the Brahmin to the Harijan), and a few Muslim landowners as well. A few big Hindu landowners had Muslim tenants and servants, while Muslim landowners had Hindu servants. The bulk of the Muslims were engaged in a variety of activities—trading in several articles including paddy and mangoes; hiring out carts, cycles and gas lanterns; tailoring; carpentry; smithy; and butchery. Ownership of land, except in the case of a few big landowners, seemed to prevent a majority of the Hindus from becoming traders. Thus, though the mango trees were owned by Hindus, the entire mango trade was in the hands of Muslims. This phenomenon (as was the trade in hides) is regional and not confined to Rāmpura. There are prosperous Muslim traders and landowners in the neighbouring villages of Kalkuni, Bannūr and Gargheshwari. There exist in this area Hindu and Muslim families linked together by friendship and patron-client ties. Apart from this, Muslims perform certain tasks which the dominant Hindus cannot undertake. For instance, Hindu reluctance to kill cattle gave rise to a form of exchange trade called *cati* by which itinerant Muslims exchanged their superior animals for the inferior ones of Hindus for a consideration. These animals ultimately reached the butcher's yard. Muslims often provide the goods needed in Hindu festivals. Muslims are invited to Hindu weddings, and sheep and goats are slaughtered ritually by a Muslim butcher so that Muslims may eat the wedding dinner. Occasionally, an old Muslim client may be sent by his Hindu patron to find out the correct subcaste and sectarian affiliation of a Hindu peasant with whose family matrimony is contemplated.

When the members of a religion or sect dominate trade or commerce, the customers are drawn from several religions. Thus the basis of the specialization itself creates ties between several religious groups. This is true of all parts of India. Pārsis controlled the liquor trade not only in the former Bombay Presidency, but outside as well. Moplah traders are to be found not only in Kerala but also in Mysore, Madras and Bombay. Jain traders are prominent in Bombay, Ahmadābād, Rājasthān and Mysore.

In brief, economic, social and other ties obtain between members of different religious groups at the local level. It is, however, true that the pro-Pākistān movement of the forties disturbed the integration of Hindus and Muslims into local communities.

It is well known that some religious groups have played an

important role in the economic development of the country. The small community of Pārsīs in Bombay is an example. (The Bombay or urban Pārsīs offer, however, a contrast to the poor and backward Pārsīs in the rural areas of the Surat District.) The Jains have also played an important part in economic development, especially Jains from Bombay, Gujarāt and Rājasthān. Some Muslim groups in Gujarāt, the Dā'ūdī Bohoras, Khojas and Kutchi Memons, have shown a marked predilection for trade and commerce. The Syrian Christians of Kerala have played a pioneering role in banking and in growing plantation crops such as tea, coffee and rubber.

It is necessary here to enter a caution against a conclusion likely to be drawn from the above remarks. While minority religions have undoubtedly played an important part in economic development, a closer look will show that in India commercial activity has always been confined to small groups. Among Hindus, a few groups such as the Gujarātī Baniyās, Telugu Komatis, Tamil Cettiārs and the trading castes in Uttar Pradesh have shown a greater sensitivity to commercial opportunities than non-trading castes. It is hardly necessary to add that an effect of the caste system is to confine a skill to a hereditary group. In some areas there are Muslim trading groups—Moplahs in Kerala, Labbe in Madras and the Gujarātī Muslim groups mentioned earlier. Nowadays, however, with growing population and the weakening hold of caste, new groups have entered the commercial and industrial field. The Pātidārs of Charotar, originally a peasant caste, have shown great ability in commerce and industry not only in Gujarāt and the rest of India but also in East Africa. In South India the anti-Brahmin movement forced the Brahmins out of government jobs and made them enter trade, commerce and industry, fields in which some of them are doing remarkably well.

So, too much should not be read into the fact that minority religions are found to be active in trade and commerce. Even among Hindus, trade is confined to a few caste groups. Again, in a changing socio-economic situation, new groups have entered the field and shown their competence. Finally, it is beyond dispute that Western India, especially the area including modern Gujarāt, Rājasthān, Punjab, and the Pākistān areas of Sind and West Punjab, have produced commercial groups which have dominated trade and industry in India and even beyond. On the East Coast, only the Cettiārs have shown similar ability.

Religious and sectarian organizations are frequently found running schools and colleges in which members of the religion or

sect running the school or college enjoy some preference. Christian missions have been responsible for starting many a school and college in various parts of the country. Khālsa colleges in Punjab and Western Uttar Pradesh are run by the Siromāṇi Gurdwāra Prabandhak Committee which is in charge of gurdwāras. The Ārya Samāj and the Sanātan Dharam Sabhā likewise run several schools and colleges in Punjab and Uttar Pradesh. Sectarian and religious organizations try to find employment for their members. Caste may be said to be an effective employment agency in all parts of India.

The role played by religion in the political life of the country is similar to that of caste. In the thirties the Muslim League first began to press its demand for an independent Muslim state to be called Pākistān. Before the formulation of this demand, Muslims and Hindus together formed fairly integrated local communities in many parts of the country and we have already given an idea of the kind of ties binding them. The intimacy and closeness of these ties did not prevent an occasional outburst of rioting over religious matters. But that was not very different from inter-caste or inter-village fighting which also occurred in spite of normally friendly and intimate bonds prevalent between neighbouring castes or villages.

It may be noted in this context that Muslims lagged behind the Pārsis and Hindus in taking to Western education, and in attempting to reform their traditional institutions. That meant exclusion from government service and the professions. It was with a view to remedying this situation that Sir Syed Ahmad founded the Muhammadan Anglo-Oriental College at Aligarh in 1875, and this developed into the Aligarh Muslim University in 1920. The Muslim League was founded in 1906 and it became the spokesman for the protection and furthering of Muslim interests conceived in a narrow sense. It did not emulate the Indian National Congress and try to speak for the country as a whole. Mahatma Gandhi's espousal of the cause of the displaced Turkish Caliphate in 1919 resulted in the League and the Congress coming together but only for a brief while. In the thirties the Muslim League found an astute leader in M. A. Jinnah, an ex-Congress member and he succeeded in founding Pākistān. The creation of Pākistān did not, however, mean the dissolution of the Muslim League in India. It is still active in the South, and in the 1959 elections in Kerala it formed an alliance with the Prajā Socialist Party, the Congress, the Catholics and the Nāyar Service Society against the Communists.

The Akhil Bhārat Hindu Mahāsabhbā is another religious

party, which has as its aim the promotion of Hindu culture and Hindu *Rāṣṭra*. It aims at re-establishing the integrity of India through constitutional means. Its membership in 1960 was 4·5 lakhs and in the General Election of 1957, it secured 3 seats in the Lok Sabhā and won 7 out of 40 seats it contested in Madhya Pradesh. In the General Election of 1962, it secured 1 seat in the Lok Sabhā and 6 seats in Madhya Pradesh Legislature. The Bhāratīya Jan Sangh is yet another party with a membership of 6 lakhs. In the General Election of 1962, it won 14 seats in the Lok Sabhā and 116 in the various State Legislatures.

In this connection, reference must be made to the Rāṣṭriya Swayam Sevak Saṅgh. While claiming to be an organization interested only in reviving Hindu religion and culture, it exhibited a para-military character, with uniforms, drill and training in the art of self-defence. The movement grew as a reaction to the Muslim League's activities in the forties. After the assassination of Mahatma Gandhi in 1948 the Saṅgh came under a cloud.

Sikh politics is closely connected with the control of the gurdwāras, which are in charge of the Śiromāṇi Gurdwāra Parbandhak Committee (S.G.P.C.). The Akālī Dal, led by Master Tara Singh, was long in control of the S.G.P.C., but it has recently come under the control of another Akālī group. The Akālī Dal has been agitating for a Sikh-dominated "Panjabī Sūbā".

The Christians have not formed a separate political party anywhere in India. The Syrian Christians, however, have had a part in Kerala politics similar to that played by dominant castes elsewhere in the country. The politics of the former Travancore State was marked by keen rivalry between the Syrian Christians and the Hindus. For a year before the general elections in 1951, the Democratic Congress, a Hindu-dominated party, carried on propaganda against the Indian National Congress on the ground that the latter was dominated in Travancore by the Syrian Christians. The attempt of the Congress Government in Travancore-Cochin to obtain financial control of the schools in 1951 resulted in its alienating the Christian missions which ran many schools. The clergy and the Catholic Congress supported Independent Catholic candidates against the National Congress nominees in the General Elections of 1957. In the 1959 elections, however, the attempts of the Communist Government of Kerala to exercise control over the appointment of teachers in schools and to extend their authority in other matters relating to education evoked systematic opposition from the Christians, especially the Catholics. An alliance of the Catholics, the Muslim League, the Nāyar Service Society, the Prajā Socialist Party and the National Congress resulted in the

defeat of the Communist Government and in the establishment of a Coalition Government.

According to the 1951 Census (adjusted to 1961 boundaries), the Hindus represent 85% of the total population, Muslims 9·9%, Christians 2·3%, Sikhs 1·7%, Jains 0·5%, Buddhists 0·05% Zoroastrians 0·03%, Other Tribal Religions 0·47% and Non-tribal Religions 0·03%. Systematic information is lacking on the place and role of religious minorities in Indian social life, and on the relations between majority and minority religious groups. It may be noted in this connection that, even after the creation of Pākistān, India has a large Muslim population of more than 40 millions. The Republic of India is a secular state and there is no discrimination between one citizen and another on religious grounds.

During British rule the Sikhs, Panjābī Muslims, Rājputs, Gurkhas and Marāthās were classified as "martial races" and enjoyed preference in recruitment to the armed forces of the country. The distinction between martial and non-martial races was ignored in World War II, when there was a large demand for fighting men at all levels. In Independent India only the Scheduled Castes and Tribes enjoy some concessions and privileges, including reservation of seats in the legislatures and the local self-governing bodies. The Anglo-Indians (numbering 111,637 in 1951) also enjoy some concessions including reservation of seats in the central legislature and a few State legislatures. Every State in the Indian Union has made rules giving preference to "Backward Castes" in the matter of appointment to Government posts, admission to schools and colleges, and the award of scholarships and free studentships.

With the achievement of Independence, Sikhs, and Panjābī and Sindhī Hindus poured into India from West Pākistān, while the bulk of the Bengali-speaking Hindus evacuated East Bengal and moved into West Bengal. The problem of the resettlement of refugees from West Pākistān is no longer there, but that cannot be said about refugees from East Pākistān.

The sociologist looking at the problem of minorities in a segmented, stratified and multireligious society finds that, really speaking, everyone is in a minority. The numerically small Hindu castes feel that they are not getting their due share of power and Government jobs. The tribes are in a minority *vis-à-vis* the total Hindu population. The sense of being in a minority is widespread; but even so, the problem of religious minorities is a special one.

In Independent India legislation has been passed modifying some institutions of the Hindus. (The term "Hindu" includes also

Buddhists, Sikhs and Jains.) Monogamy is binding on Hindus and bigamy (including polygyny and polyandry) is an offence. Certain female relatives such as widow, daughter and mother are now entitled along with the sons to a share in the estate. The payment of dowry has been banned. But there is reluctance on the part of the Government to undertake legislation to change any institution of Muslims and Christians. Only social legislation (e.g., factory laws) which does not touch religious susceptibilities has been made applicable to all.

### *Towns and Villages*

A population of 100,000 or more entitles a place to be classified as a "city"\*. Census Superintendents have the power to classify places with less than 100,000 people as cities when Rural and urban differentiation they have special reasons (unspecified) to do so. It may be noted here that whereas in the previous censuses all places with a population of 5,000 and more, and in some special cases, even places with less than 5,000 were classified as towns, in the 1961 Census, certain uniform criteria have been laid down for determining whether a place is a village or a town. A place is considered as a town when it satisfies the following conditions: (1) population is more than 5,000 ; (2) density is not less than about 400 per sq. km. and (3) not less than 75% of the adult male population is engaged in non-agricultural activities.

The changing proportions of rural-urban to total population for the 1901-61 period are given below :—

TABLE III  
*Rural and urban population (1901-61)*

Year	Percentage of rural population to total population	Variation	Percentage of urban population to total population	Variation
1901	89·16	...	10·84	
1911	89·71	+0·55	10·29	-0·55
1921	88·82	-0·89	11·18	+0·89
1931	88·01	-0·81	11·99	+0·81
1941	86·14	-1·87	13·86	+1·87
1951	82·71	-3·43	17·29	+3·43
1961	82·03	-0·68	17·97	+0·68
1901-61	...	-7·13	...	+7·13

\* It is interesting to note that in the United States of America, a population of over 10,000 entitles a place to be classified as a city while a town is a place with a population of 2,500—10,000.

Less than 18% of the total population is urban. The ratio of rural population began to decrease gradually from 1921. In the 1941-51 decade the ratio of urban population rose by 3·43%, due to the heavy influx into towns and cities of persons displaced by the Partition. In the Table below is given the distribution of urban population in the major States, along with their respective rank-order for the period 1921-61.

TABLE IV

*Percentage of urban population to total population for 15 States from 1921 to 1961\* and their rank*

State	1921	Rank	1931	Rank	1941	Rank	1951	Rank	1961	Rank
Andhra Pradesh	10·21	10	11·13	10	13·43	8	17·42	8	17·44	7
Assam	2·80	14	3·06	14	3·33	14	4·65	14	7·69	14
Bihār	4·14	13	4·54	13	5·40	13	6·77	13	8·43	13
Gujarāt	20·15	1	20·50	1	23·79	1	27·23	2	25·77	3
Jammu & Kashmīr	11·04	8	11·90	8	13·12	9	14·05	9	16·66	8
Kerala	8·73	11	9·64	11	10·84	11	13·48	11	15·11	10
Madhya Pradesh	7·51	12	8·30	12	9·81	12	12·02	12	14·29	11
Madras	15·85	3	18·02	3	19·70	4	24·35	3	26·69	2
Mahārāshtra	18·50	2	18·60	2	21·11	2	28·75	1	28·22	1
Mysore	13·76	6	15·30	5	16·94	5	22·95	5	22·33	5
Orissa	2·52	15	2·54	15	3·00	15	4·06	15	6·32	15
Punjab	11·20	7	12·98	7	15·00	7	19·01	6	20·13	6
Rājasthān	14·33	5	14·72	6	15·27	6	18·50	7	16·28	9
Uttar Pradesh	10·58	9	11·19	9	12·41	10	13·64	10	12·85	12
West Bengal	14·41	4	15·32	4	20·41	3	23·88	4	24·45	4

\*Adjusted to 1961 boundaries.

There is certainly much difference between the various States in the distribution of urban and rural population. Orissa and Assam are at one end of the scale with a great proportion of rural population, while at the other end are Mahārāshtra, Madras and Gujarāt. Rapid rise or decline in the ranks of urban population is not experienced by any State except Andhra Pradesh which, in three decades, moved up from the tenth to the seventh position.

Urban population is subdivided into six categories on the basis of size. The index of growth of population in each category is given below.

TABLE V  
*Index of growth of population in towns*

(Base 1901=100)

Year	Total urban population	100,000	50,000-100,000	20,000-50,000	10,000-20,000	5,000-10,000	Less than 5,000
		I	II	III	IV	V	VI
1901	100·00	100·00	100·00	100·00	100·00	100·00	100·00
1911	100·35	107·68	83·86	111·56	92·07	98·17	111·09
1921	108·64	120·61	107·02	116·62	92·29	102·14	128·04
1931	129·41	143·48	140·93	150·82	112·29	112·97	117·30
1941	170·79	246·96	194·24	183·90	131·88	131·68	95·63
1951	241·55	416·87	258·64	253·62	160·40	159·61	126·40
1961	305·34	617·04	323·26	359·36	193·26	118·97	53·94

From the above Table it is seen that Class I towns have grown spectacularly during the period 1931-61 while Class II and III have grown more or less uniformly. Again, while Class IV towns are consistent in their growth, Class V and VI towns have shown a marked decline in their index of growth during 1951-61. In 1951 there were 76 cities, and 111, 374, 675, 1,195 and 629 towns in Classes II, III, IV, V and VI respectively, making up a total of 3,060 towns. Further, in 1951, there were 5 metropolitan cities, each with a population of a million or more. They were Greater Calcutta, Greater Bombay, Madras, Delhi and Hyderābād. Of these, the last three cities attained metropolitan status only in 1951. The number of towns in 1961 has decreased to 2,700.

As for the rural population, 68 per cent of a total of 558,088 villages have less than 500 people each, 19·6 per cent have 500-1,000, 9·3 per cent have 1,000-2,000, 3·6 per cent have 2,000-5,000 and 0·4 per cent have more than 5,000.

A few characteristics which distinguish rural from urban populations may be mentioned here. They may be listed under Some characteristics four heads : sex composition, literacy, marital status and livelihood.

Table VI on p. 528 gives the sex ratio of rural and urban populations in India as a whole and in the major States.

TABLE VI

*Number of females per 1,000 males, urban and rural, 1951\**

State	Rural	Urban
Andhra Pradesh . . . . .	985	987
Assam . . . . .	887	682
Bihār . . . . .	1,002	842
Gujarāt . . . . .	964	920
Jammu and Kashmīr . . . . .	882	823
Kerala . . . . .	1,033	992
Madhya Pradesh . . . . .	975	907
Madras . . . . .	1,014	986
Mahārāshtra . . . . .	1,000	807
Mysore . . . . .	974	941
Orissa . . . . .	1,015	807
Punjab . . . . .	870	812
Rajāsthān . . . . .	919	928
Uttar Pradesh . . . . .	925	820
West Bengal . . . . .	939	660

\*Figures of 1951 Census are provisional.

Adjusted to 1961 boundaries.

Table VII gives the number of females per 1,000 males for the total population of each State in 1961, and the number of females per 1,000 males for the urban population of each State in 1951 and 1961. The sex ratios for rural population are not yet available.

TABLE VII

*Number of females per 1,000 males in urban areas*

State	Total population 1961	Urban population 1961	Urban population 1951*
Andhra Pradesh . . . . .	981	951	987
Assam . . . . .	876	677	682
Bihār . . . . .	994	811	842
Gujarāt . . . . .	940	896	920
Jammu and Kashmīr . . . . .	878	844	823
Kerala . . . . .	1,022	991	992
Madhya Pradesh . . . . .	953	856	907
Madras . . . . .	992	963	986
Mahārāshtra . . . . .	936	801	807
Mysore . . . . .	959	913	941
Orissa . . . . .	1,001	807	807
Punjab . . . . .	864	814	812
Rajāsthān . . . . .	908	882	928
Uttar Pradesh . . . . .	909	812	820
West Bengal . . . . .	878	701	660

\*Figures of 1951 Census are provisional.

Men preponderate over women in urban areas and this is probably due to the character of the migration to urban areas. The ratio of women in urban areas does not, however, vary inversely with the degree of urbanization. Thus, West Bengal as well as Assam show a more or less similar ratio of urban women. On the other hand, Madras, Kerala and Andhra Pradesh have the highest ratio of urban women.

The marital status of persons under the categories of unmarried, married and widowed or divorced seems to vary with rural-urban residence. The following Table from the Marital status 1961 Census gives the rural-urban distribution of population according to their marital status by sex and age :

TABLE VIII  
*Marital status, India\* (1961)*  
(Percentages)†

Age group	Rural Urban	Never Married		Married		Widowed		Divorced	
		M	F	M	F	M	F	M	F
All ages excluding 0—9	R	31·9	15·8	61·9	67·6	5·6	15·8	0·6	0·8
	U	39·5	24·2	56·5	61·2	3·7	14·0	0·3	0·6
All ages including 0—9	R	52·4	41·5	43·3	47·0	3·9	11·0	0·4	0·5
	U	55·2	46·5	41·8	43·2	2·8	9·9	0·2	0·4
10—14	R	92·1	77·7	7·7	22·0	0·1	0·2	0·1	0·1
	U	98·1	93·1	1·9	6·8	N	0·1	N	N
15—24	R	56·5	14·2	42·3	84·0	0·7	1·0	0·5	0·8
	U	73·1	29·4	26·4	69·4	0·3	0·7	0·2	0·5
25—34	R	11·5	1·2	85·2	93·2	2·3	4·6	1·0	1·0
	U	19·0	3·0	79·1	92·2	1·5	3·9	0·4	0·9
35—44	R	4·2	0·6	89·9	82·6	5·1	15·8	0·8	1·0
	U	4·8	1·3	91·4	82·5	3·4	15·2	0·4	1·0
45—54	R	3·3	0·4	85·3	62·0	10·7	36·8	0·7	0·8
	U	3·3	0·9	88·1	60·2	8·2	38·1	0·4	0·8
55—64	R	2·9	0·3	77·2	38·5	19·3	60·6	0·6	0·6
	U	2·7	0·9	80·4	35·7	16·4	62·9	0·5	0·5
65—69	R	2·9	0·3	70·2	27·6	26·3	71·6	0·6	0·5
	U	2·7	0·9	73·2	25·2	23·6	73·5	0·5	0·4
70 and above	R	2·8	0·3	60·2	15·1	36·4	84·2	0·6	0·4
	U	2·6	0·8	62·4	13·1	34·5	85·8	0·5	0·3
Age not stated	R	71·7	72·9	24·1	20·7	3·1	5·7	1·1	0·7
	U	73·0	72·9	24·1	20·0	2·6	6·6	0·3	0·5

'N' denotes negligible figures.

\*Excludes that portion of North East Frontier Agency for which an abridged family schedule was canvassed instead of the general all-India individual slip and household schedule.

†Figures have been worked out after excluding the figures of unspecified status from total population.

The urban percentage of married males and females in the age group of 15-24 is significantly lower than the rural percentage. There are more early marriages in rural areas than in urban areas.

Literacy is another feature by which rural population might Literacy be distinguished from urban population.

TABLE IX

*Literates aged 10 and over as percentage of total population aged 10 and over (1961)*

	Rural	Urban
Males . . . . .	37·06	69·7
Females . . . . .	10·14	41·41

It is seen from the above Table that urban literacy percentages for both males and females are significantly high.

The following Table gives literacy rates for the year 1961.

TABLE X

*Literacy rates (1961) (excludes 0-4 age group)*

Total per thousand	..	282
Males per thousand	..	404
Females per thousand	..	153

The rural pattern of livelihood is different from the urban, a high proportion of people living in villages being either engaged in agriculture or dependent indirectly upon it. The Rural pattern of life Against the general background of rural-urban differentiation, some of the more specific features of rural life are delineated below. They are described under the following heads: land relations, self-sufficiency of the village community, unity of the village community, and urban life in pre-industrial India.

The rural pattern of life is largely organized around land, still the most important source of wealth. Even in villages, Land relations dominated by artisan and trading castes, land is the ultimate source of prosperity. Arable land is a scarce commodity and there is heavy pressure on it.

The average size of landholdings in India in 1951 was 3·03 hectares and the estimated number of holdings was 35·5 millions. The average size compares favourably with 0·81 hectare in Japan and 0·91 hectare in Egypt, but unfavourably with 26·73 hectares in the United Kingdom and 87·21 in the United States of America.

**TABLE XI**  
*Average size of landholdings in census zones (1951)*

Average holdings (in hectares)	
North India	2·14
East India	1·82
South India	1·82
West India	4·97
Central India	4·93
North-West India	5·09
All-India	3·03

**TABLE XII**  
*Average size of holdings in selected States (1951)\**

States	Hectares	States	Hectares
Assam	2·19	Hyderābād	5·70
Bihār	1·65	Madhya Bhārat	5·13
Bombay	3·92	Mysore	2·91
Madhya Pradesh	5·62	PEPSU	6·24
Madras	1·82	Rājasthān	6·83
Orissa	4·77	Saurāshtra	11·87
Uttar Pradesh	2·14	Travancore-Cochin	0·97
West Bengal	1·90	Jammu and Kashmir	1·53

All-India 3·03 hectares.

There is great variation in the average size of holding between the different States, Travancore-Cochin having the lowest with 0·97 hectare and Saurāshtra having the highest, 11·87 hectares.

**TABLE XIII**  
*Pattern of landholdings†*

Size of holding (hectares)	% of total number of households
Nil	6·3
0·04— 1	48·5
1·01— 2	15·9
2·02— 3·03	9·3
3·03— 4·04	5·6
4·04— 6·06	5·5
6·07—10·10	4·9
10·11 and above	4·0
Total	100·0

\* The Agricultural Labour Enquiry Committee Report, Vol. I, 1954.

† National Sample Survey, July 1954—March 1955, 8th round.

From Table XIII p. 531, it is seen that among landowners 64·4% of the households have less than 2·02 hectares each. Whether land is owned by a family or not, the area of land owned, the form of tenure under which land is held, the cropping pattern which prevails, and the availability or otherwise of irrigation facilities have a bearing on inter-caste, and inter-familial relations. The landowning pattern, for instance, is such that a small number of people own the bulk of the local resources and the majority of the villagers are dependant upon them. Irrigated areas are able to support a larger number of landless folk than non-irrigated areas.

It is well known that the entire family of the peasant, including young boys, work on the family farm. According to the National Sample Survey, the average size of the rural family for India is 5·2. Generally speaking, the families of landless labourers are small, less than the national average. Only when there is wealth in some form—land, herds, trade or industry—does the size of the family exceed the national average.

The picture we then get of the rural family pattern is of a very small number of large families owning big farms (relatively) and a large number of small families owning little or no land.

Two other characteristics of Indian agriculture may be mentioned here: fragmentation, and dispersal of holdings. The holding of a peasant may be in several pieces and the distance between one piece and another may be more than 1·5 km.\* The dispersal of holdings is minimal in dispersed villages where each farmer lives on his farm.

In rural areas, the rhythm of social and ritual life bears a close relation to the pattern of agricultural activity. Each stage of the growth of the staple crop is marked by the performance of ritual. The first ploughing takes place on an auspicious day and harvesting is followed by festival and dance. The eating of first fruits is a ceremonial occasion. Weddings, pilgrimages and journeys are also undertaken after harvest. In those areas where two major crops are grown, peasants have little leisure while in unirrigated areas where a single crop is grown, peasants are under-employed.

The physical isolation of the village, the incredibly bad roads connecting it with other villages, the payment for services and goods by means of locally grown grain, and the fact that each

\*Attempts have been made in some parts of the country to bring about the consolidation of holdings. They have not been conspicuously successful because of Hindu inheritance law on the one hand and the growing population on the other. The former requires the distribution of land among all sons, and the latest changes in the Hindu law make the position worse by giving shares to certain female relatives.

village produced many of the things it wanted including tools, cloth, blankets and jewellery created the illusion of self-sufficiency.

Village self-sufficiency Even at the beginning of the 19th century villages were not self-sufficient. Today they are far less so; they are inalienable parts of a wider economic, political and religious kinship and social networks.

Weekly markets (*hāts* in North India, *santhe* in South India) occur all over the country. Peasants from many villages make use of weekly markets, and some markets are famous over a wide area. Some of these markets specialize in certain goods such as cattle, livestock or cloth. When the weekly markets do not meet his wants, the peasant makes a journey to town. For instance, shopping for a wedding is done in the nearest big town.

The existence of weekly markets underlines yet another fact: most villages do not have the artisan and servicing castes which can make them self-sufficient. Artisan and servicing castes are frequently found serving more than one village and this is specially true of castes which do not meet everyday wants.

The pattern of landholding also cuts across villages. Some part of the arable land in a village is owned by people resident in neighbouring villages and towns. Again, tenants in one village may be cultivating land lying in another, and outsiders also may be cultivating village land.

Under British rule the village became, however incompletely, a part of national as well as international economy. The development of textile industry in Lancashire, for instance, hit the village weaver hard, and village crafts suffered generally from competition with mass-produced goods from Britain. Commercial crops such as cotton, tobacco, silk, sugar-cane, coffee and tea subjected the peasants growing them to the vagaries of world prices. And during World War II, rationing covered a great many villages in the country. The economic net is indeed being drawn tighter every day over India's numerous villages.

The village was always a part of a wider political system. The smallest political unit in Indian history seems to have been a chiefdom comprising a few villages. Above the chiefdom was the kingdom, the king exercising suzerainty over several chiefdoms. Above the king was the emperor or his representative, the viceroy. In pre-British India wars between rival chiefs and kings were frequent, and villages felt the effect. The maintenance and movement of troops meant the taking away of grain and fodder from the farmers as also the livestock raised by them. A "scorched earth" policy was occasionally followed by retreating troops to prevent supplies from falling into enemy hands.

Under British rule, administration was gradually extended to include villages in every part of the country. The development of communications—roads, railways, post and telegraph—facilitated the movement of goods to and from villages. This helped to reduce the menace of famine, while the development of medicine enabled epidemics to be fought and rural health improved. Attempts were made to introduce local self-government in the villages. During World War II certain administrative measures such as the rationing of essential commodities, procurement of grain, and a ban on the movement of foodstuffs affected practically every village in the country. Independence has accentuated this tendency for the village to be sucked in more and more effectively into the politico-economic system of modern India. The abolition of princedoms, *zamindāri* and *ināmdāri* streamlined the administrative machinery and helped to bring the Government into closer contact with the actual tiller of the soil. The State Governments are following a policy of protecting the tenant from eviction, and imposing a ceiling on the amount of arable land a man may hold. The Constitutional abolition of untouchability and the passing of the Untouchability (Offences) Act (1955) make the subject of social relations between the high castes and the Harijans a matter of direct concern to the Government. The village panchāyats have been strengthened by policy decisions at the all-India level. Adult franchise for elections to the State as well as the Central Parliament has made the village an effective part of the political structure of India. The Community Development Programme and the National Extension Service will soon cover every Indian village.

The villages were not self-sufficient in the field of religion either. Hindus, Muslims and Christians regularly made pilgrimages to nearby shrines and other holy places. Villagers often owed allegiance to nearby monasteries which appointed agents to look after the religious life of the faithful. The popularity of religious discourses (*harikathā*, *kirtan* and *bhajan*) carried to the villager Hindu mythology and the theological notions of Sanskritic Hinduism.

No village is able to find within its boundary spouses for all its boys and girls. Some of them have to marry out. Even in the South, where cross-cousin marriage and cross-uncle niece marriage are preferred, a multicaste village has marital relations with at least a few dozen villages; in the North, where the village is exogamous, the circle is much wider.

Does a multicaste village have any unity? The village is often divided into discrete wards where different castes live. In Gujarat such areas are referred to as *phaliya*, in the Karnātaka

as *kēri* and in Mahārāshtra as *wāda*. This type of segregation is found in other parts of India as well. In Punjab the *tholla* or Unity of the *panna* is the residential area of a lineage or its segment. For instance, in Shampur village, 10 km. from Delhi, there are three *pannas*, *Tehai*, *Pachu* and *Nawade*, the first being relatively a new settlement of two segments of single lineage of the locally dominant caste of Ahīrs.

Sometimes this principle of aggregation and segregation on the basis of caste leads to a "village" being formed of a few discrete hamlets. Everywhere the Harijans live separately from the Caste Hindus.

The members of a ward show a strong sense of unity. This is partly territorial and partly due to the existence of other strong bonds such as those of caste and lineage. Inter-ward disputes occur occasionally like inter-village disputes. But, then, the very division into wards enforces interdependence because of the castewise division of labour. The weaving of stratified castes into a unity on the basis of division of labour and common loyalty to the village may be termed "vertical solidarity", which may be distinguished from "horizontal solidarity", i.e., the solidarity of a caste.

The people of a village have a sense of unity and identity. The celebration of village festivals brings out this latent characteristic. When epidemics or drought hit a village, the local deities are propitiated for protection.

Indian rural society is marked by solidarities such as caste, kin and village. Religion underwrites each of these solidarities and also links up the village with wider solidarities. The patron-client tie is another important solidarity and this frequently cuts across kin, caste, village and religion. The patrons have the duty of looking after the interests of the clients in return for labour, service and loyalty on the part of the latter. But then, only some of the clients are "core" clients while the others are "marginal" clients owing allegiance to more than one patron. Marginal clients transfer their allegiance from one patron to another.

It is now appropriate to mention the existence of factions which are nothing other than groups dividing the village community. Each faction is headed by a patron or leader. Where factions coincide with pre-existing bonds of caste, kin, lineage and ward, they tend to be very strong. And this in turn means that the factions replace the village as the focii of the villager's loyalties. There is no easy solution to this situation as development workers have discovered.

There is a view that village solidarity as such does not exist, and the only solidarity is that of caste. When an inter-village fight

occurs, the leaders (patrons) of the dominant castes get involved and the others, especially the members of the lowest castes, are dragged into it because of their clientship and fear of the dominant castes. This is a plausible view, but it ignores the fact that all rural folk are distinguished on the basis of village membership in a caste context, and distinguished on the basis of caste in the context of village membership. All the solidarities we have mentioned do exist, including loyalty to one's village, and they result in a network of ties which make rural society.

Towns are not new in India. They existed as far back as the time, when the Indus Valley Civilization flourished. Several types of towns existed in pre-industrial India—  
Urban life in pre-industrial India pilgrim-centres, and "political", commercial and university towns.

Pilgrim-towns are located at holy places—on the banks of a sacred river, at the confluence of two rivers, on the sea coast or on a hill-top. Some pilgrim-centres attract pilgrims only from a small area, while a place like Vārānasi or Allahābād or Tirupati or Mathura attracts pilgrims from all over the country. Pilgrim-centres have a large floating population for whose convenience hospices have been built by rich men or religious organizations or the Government. They abound in religious mendicants. They also attract traders. Some of these temples have a very large income; for instance, the Tirupati temple has an annual income of over sixty lakhs of rupees and a part of this money goes towards meeting the expenses of Sri Venkateswara University. Some Sikh gurdwāras also have a large income which is used for running educational institutions. Occasionally, the pilgrim-towns are centres of traditional learning and culture. People from all parts of the country, including tribal areas, go to the more famous of the pilgrim-towns; and in the case of Hindus, they are an important source of Sanskritization.

Delhi, Āgra, Ahmadābād, Hyderābād, Poona and Mysore are examples of "political" towns : they were the capitals of rulers, Hindu and Muslim. A capital means an army, police, bureaucracy and market. Traditionally, the ruler was expected to be a patron of the arts and learning, and his court attracted artisans, literary men and scholars from surrounding areas. The large number of people living in the capital had to be fed, and this involved the exploitation of the country-side both by merchants and bureaucrats. A king usually built a new temple or patronized an old one, and his devotion resulted in the temple becoming popular with his subjects. The fortunes of political towns varied with the fortunes of their rulers.

The "commercial" towns varied from small market-towns (*maṇḍi*), where the peasant sold his surplus and bought the goods he wanted, to big centres of banking and trade. Frequently, the latter were located in capitals. India had a developed system of banking even before the arrival of the British. The bankers were occasionally called upon to stand surety for their king when he had to buy off an invader. In Gujarat, every town had a council (*mahājan*) consisting of the representatives of the important trades and crafts, and the head of the council was called *Nagar Sheth*. He was an important and powerful figure and had some ritual privileges.

There were also centres of traditional learning. In ancient times Taxila and Nālanda were University towns. There were six hundred resident teachers in Nālanda.

It should be emphasized here that the distinctions we have made between different kinds of towns were not mutually exclusive. A political town was also a centre of trade and commerce and of traditional learning, and a pilgrim-town was also a centre of learning and trade. One kind of speciality tended to attract the other specialities.

The traditional towns did not involve any sudden break with rural social life. Rural-urban continuum did exist even though the residents of the towns, especially the richer people, were more sophisticated in their speech and behaviour. The term *nāgarika* (resident of a city) also means one who is refined or civilized.

An important reason for the existence of continuity between rural and urban life was the fact that the better-off townsmen owned land and thought of land as a major source of investment. In fact, the status of a man even in urban areas improved if he owned land.

### 3. Marriage, Kinship and Inheritance

The traditional literature of pre-British India, including the Vedas, Smṛtis, Epics, Purāṇas and other literary works, and Buddhist and Jain literature, provides information on the religious, social and political life of the Hindus.

Marriage The source material is not all of the same kind, nor equally rich in all sectors of social life. In the field of marriage and kinship, however, the material is more copious than in some others, but a few limitations of the data need to be mentioned. It is obvious that the material covers only the

Hindus, and among them only the higher castes. This latter fact has been frequently ignored; worse still the institutions and beliefs of the "twice-born", and especially the Brahmins, have been interpreted to be the institutions and beliefs of all Hindus. Thus, the ban on divorce and widow marriage has been unquestionably assumed to hold good for all whereas it holds good only for the "twice-born" castes. Again, it is assumed that the rules governing marriage, adoption, inheritance, inter-caste relations, etc. were observed by everyone, everywhere, while it is likely that the degree of observance varied from one section of the society to another and from one part of India to another. Intensive field research carried out in recent years in different parts of India has thrown a great deal of doubt on the picture which Indologists had presented to the scholarly world about Indian society. It is now seen that this represented a book view and an upper caste view, and that the reality was far more complicated and diversified.

While there is much variation between different groups in the customs and beliefs regarding marriage and kinship, the institution of marriage itself is common to all. It is well known that marriage is an essential duty for all Hindus. It is a sacrament, and among the "twice-born" castes religious considerations are especially prominent in making marriage obligatory. A son is thought to be necessary because he performs periodical rituals, including the annual *Śrāddha*, which keep the dead ancestors out of a hell called *put*. Marriage enables the individual to enter the second stage of *gṛhastya* (householdership), and through its ritual the husband and wife perform five great sacrifices to the creator (*Brahmā*), ancestors, deities, elements, and fellow human beings. Among the non-*dvija* castes, however, marriage has a more secular character. In the rural areas a son is essential to cultivate the family land and to look after the parents in their old age. Even among the *dvija* castes the secular importance of marriage is considerable, often huge dowries being paid to the groom.

Marriage among Muslims is a contract which a man and a woman enter into by mutual agreement, but rituals are performed on the occasion of marriage. A sermon (*khuṭbā*) sanctifies the contract before the parties announce their acceptance of it.

Early marriage is still common in India though the marriage age has been going up in the last few decades among the urban and educated sections. The median age at marriage in different countries is given in Table XIV p. 539.

It is seen that India has the lowest median age at marriage both for females and males. The highest median age at marriage is registered by West Germany.

TABLE XIV

*Median age at marriage of those married up to age 52·5\**

<i>Country</i>	<i>Females</i>	<i>Males</i>
Egypt (1948)	19·4	25·2
Canada (1951)	21·1	24·8
U. S. A. (1950)	20·4	23·2
Japan (1950)	23·1	25·8
India (1951)	14·5	20·0
U. K. (1951)	21·9	25·2
W. Germany (1946)	24·7	27·4
France (1946)	22·6	26·0
Guatemala (1950)	18·69	22·88

S. N. Agarwala, The Age at Marriage in India, *Population Index Vol. 23, 1957.*

There are significant differences between the various religious groups and castes in the matter of age at marriage. Dr. Agarwala observes, on the basis of census data for the 1891-1931 period, that Christians have the highest mean age at marriage (17·1 for females and 23·9 for males) followed, in order, by Sikhs, Muslims and Hindus (Table XV). Dr. Agarwala also states that women of the Harijan castes have the lowest mean age at marriage followed respectively by Brahmins, and Warrior (Kṣatriya) and Trading (Vaiśya) castes, except in Mysore, Madras and Kerala where Brahmin women have the lowest mean age at marriage. The same pattern is found to prevail for men also. A caution must be entered here about the above generalizations for different *varṇas*. A *varṇa* includes innumerable *jātis* speaking different languages and also differing from each other in several other respects. Thus, two Brahmin groups from different parts of the country differ from each other in important respects—the marriage age of Brahmin girls in South India has gone up strikingly since the thirties. Even within the same linguistic region, two *jātis* belonging to the same *varṇa* may differ from each other in custom, ritual and way of life.

The Hindu Marriage Act of 1955 prescribes the minimum age of marriage as 18 for boys and 15 for girls. But this law is not strictly enforced. This is specially true of rural areas where the marriage age for girls is usually lower than 15.

## TABLE XV

*Mean age at marriage of religious groups in India*

(Average of 1891-1931)

Religious groups	Female	Male
Hindus	12·5	19·7
Jains	13·1	20·5
Muslims	13·2	21·0
Sikhs	15·0	22·5
Christians	17·1	23·9

Attempts were made to classify Hindu marriages as early as the beginning of the Christian era. Manu classified them into eight forms : *Brāhma*, *Daiva*, *Ārṣa*, *Prājāpatya*, *Āsura*, *Gāndharva*, *Rāksasa* and *Paiśāca*. The *Āsura* and *Paiśāca* forms were both regarded as unlawful. Commentators coming after Manu accepted the eight-fold classification though they evaluated the relative merits of each form differently. Generally, the first four forms were regarded as good or merit-conferring. The above classification was apparently an "ideal" one and not the outcome of an analysis of different forms of marriage obtaining among different sections of early Indian society.

Monogamy, polygyny and polyandry all occur amongst Hindus. Here it is necessary to distinguish between what is permitted and what is practised. Until the passage of the Hindu Marriage Act in 1955, every Hindu was in theory free to marry a number of women. In fact, however, a very small percentage of Hindus were polygynous. The barrenness of a wife or her failure to give birth to a son was generally the reason for taking a second wife. Among some trading or warrior castes, a wealthy or powerful man took a second wife. Among the higher castes monogamy prevailed, the ideal of having only one wife (*ekapatiṇī-vrata*) being as old as the *Rāmāyana*.

That applies to the Jains also, but they have no religious necessity for a son. Muslims are permitted to take four wives each, provided all are treated as equal. Again, the actual incidence of polygyny among Muslims is small; only the wealthy and powerful occasionally take a second wife. Christians are forbidden to take a second wife.

Polyandry—the custom of having more husbands than one—is even less common than polygyny. A few Kerala castes practised polyandry until recently and it is not unlikely that it still continues to be practised to some extent in remote places. The Todas and Kotas of the Nilgiris, the Khāsa of Jaunsar Bāwar (Dehra Dūn District) and a few other North Indian castes also practise

polyandry. There are two forms of polyandry, fraternal and disparate. In the fraternal form, the husbands are brothers, while in the disparate, the husbands are not related to each other. The Nāyars of Kerala formerly practised disparate polyandry, whereas in the Cis-Himālayan region the fraternal form is practised even today. In the latter area the eldest brother has more rights in the wife than his younger brothers. Amongst the Todas, it is the eldest brother who marries a girl but the younger brothers also have access to her. The eldest brother performs a ceremony with a bow and arrow in the seventh month of the wife's pregnancy and this makes him the legal father of the child. In fact, he is the father of all the children born subsequently till another brother performs the bow-and-arrow ceremony. The Todas formerly practised female infanticide and this meant that there were fewer women than men. With the abolition of infanticide, women became more numerous and the Todas began to combine polyandry with polygyny.

Leviratic alliances occur among the Ahirs of Hariyāna, some Jāts and Gūjars and several other castes in Uttar Pradesh, the Kodagus of Mysore, and among some Muslim castes. In leviratic marriage a man is obliged to marry the widow of a brother, and the children born to the new couple are their own, whereas in levirate proper a man has sex relations with his brother's widow to continue the dead brother's line. In the leviratic alliances mentioned above it is customary for the widow to marry the husband's younger brother, and not the husband's elder brother, though the latter is not unknown. Sororatic alliances, i.e., the marriage of a widower with his wife's younger sister, occur in South India and probably in other areas as well.

A widower is permitted to marry in all religious groups but that is not true of a widow. Widow remarriage is permitted among Muslims, Christians and Pārsis. Among the Jains, local and caste custom determines the question. For instance, among the lower Jain castes of the Deccan, widow remarriage is common. Though it is allegedly forbidden among the Jain Baniyās of the former Central Provinces, it occurs frequently among them.

Widow marriage is common among the Hindus of the "lower" castes. But when a low caste wants to move up in the hierarchy, it imposes a ban on such marriage as also on divorce. The widespread belief that widow marriage is prohibited in Hinduism is an example of the way in which a Brahmin institution is mistaken for the institution of all Hindus. The Hindu Widows Remarriage Act, 1856, legalized the remarriage of Hindus of all castes.

Hindu marriage is in theory a sacrament and irrevocable.

Actually, divorce is practised among non-*dvija* castes in every part of the country. It was particularly easy among the matri-lineal Nāyars even as recently as sixty years ago.

**Divorce** The husband had to supply his wife with oil and cloth at three calendrical festivals and his failure to do so was regarded as a sufficient ground for divorce. Divorce is also permitted among tribal folk. The Khāsis, for instance, allow divorce for adultery, barrenness and incompatibility. Consent of the elders, and occasionally of the local panchāyat as well, is a necessary condition for the grant of divorce.

During 1940-48, several Provinces and States passed laws permitting divorce for Hindus. The Hindu Marriage Act of 1955 allows divorce for incurable insanity, incurable and virulent leprosy, and venereal diseases in an acute form. Presumption of death, conversion to another religion, assumption of *sannyāsa* and adultery also provide grounds for divorce. A wife is entitled to sue for divorce if her husband commits rape, sodomy or bestiality.

Divorce is allowed in other religious groups also. There are two forms of divorce among Muslims: divestiture (*khu'l*) and dismissal (*talāq*). In the former, divorce is the result of friendly agreement between husband and wife, and *mehr* (dower)\* has to be returned by the wife to her husband. In *talāq* the husband has the right to dismiss his wife by thrice repeating the dismissal formula. The wife's right to demand divorce is conceded by the Qurān 'Hadīth', 2). The Dissolution of Muslim Marriages Act, 1939, enables a Muslim wife to seek the dissolution of her marriage on certain grounds.

In most societies there are rules, positive as well as negative, regarding the selection of spouses. The positive rules lay down whom a person may marry, while the negative rules Selection of spouses lay down whom he may not marry. Thus endogamy and hypergamy specify the groups in which a person is expected to find a bride, while exogamous rules prohibit him from marrying in certain groups. Endogamy and hypergamy are both intimately related to the caste structure. A man has to marry within his subcaste or *jāti*. *Varṇa* affiliation is not as significant as *jāti* affiliation for purposes of endogamy. For the vast majority of the people, however, the endogamous unit consists of a series of kin-clusters living in a fairly restricted area. In South India the preference for marrying people related in specific ways as also the absence of a ban on marrying members of one's own village, results in restricting the field of marriage socially as well as spatially. Village exogamy as well as the ban on the marriage

\*See p. 477 [Ed.]

of cross-cousins, which are features of North India, extend the field. This is further accentuated in the Ganga valley where the village which receives girls in marriage regards itself as superior to the villages which supply girls to it, and therefore refuses to give its girls in return to the latter. Two factors which limit the field in the North should also be mentioned: the tendency to marry into villages not farther than 12 or 13 km. away; and to confine marital links to a few kin-groups:

Endogamous *jātis* also exist among Sikhs, Jains, Christians and Muslims. The Syeds, the aristocratic Muslim caste, are divided into endogamous groups. Sometimes the endogamous group is so small that it includes only the extended families of a man's parents. Such a group is called a *kufw* while the maximal endogamous group is called *birādari*. Among some Gujarātī castes there is strict spatial delimitation of the endogamous field.

Hypergamy occurs in different parts of India: among the Brahmins of Bengal; Anāvil Brahmins and Leva-Pātidārs of Gujarāt; Rājputs in Gujārāt and Rājasthān; Marāthās of Mahārāshtra; and Nāyars, Kṣatriyas and Ambalavāsis of Kerala. Hypergamy tends to occur where the structural gulf is narrow—in fact it may be said to occur among the different sections of a single caste rather than between castes which are widely separated. The custom of high caste Nāyar women having *sambandam* with Nambutri Brahmin men is perhaps an exception to the rule, but *sambandam* is not exactly marriage. (This is related to the tendency to minimize the husband's and father's role, an important feature of the Nāyar kinship system.) Not all Nāyar marriages are hypergamous. It may be noted here that in the traditional literature of India hypergamous (*anuloma*) marriages are permitted while hypogamous (*pratiloma*) marriages are prohibited. According to the latest legislation, all inter-caste marriages, whether of the hypergamous or hypogamous kind, are valid.

In Bengal, the Rārhīya Brahmins are divided into three *jātis*, Kulīn, Bansaj, and Śrotriya. The last mentioned are subdivided into Suddha Śrotriya and Kaṣṭa Śrotriya. The Kulīns are the highest among the three *jātis* and Kulīn bridegrooms are in great demand. A few decades ago, the demand for Kulīn men was so great that they could (and did) demand huge dowries from the parents of girls who sought to marry them. It also gave rise to polygyny among Kulīns.

Leva-Pātidār hypergamy is more intricate than the Kulīn hypergamy. The Pātidār of Charotar are divided into the people of the twenty-six, twelve and finally, six villages respectively. The women of the first group may marry men in the first, second and

third groups, while the women in the second group may marry men in the second and third groups, and the women in the third group only men in the third group. This means that there is a great demand for men in the third group. Huge dowries are paid to Pātidār bridegrooms.

Educated Indians are critical of the institution of hypergamy, and especially, of the large dowries associated with it. The classical form of Kulīn hypergamy has disappeared, while the Nāyar practice of entering into *sambandam* alliance with Nambutris is on its way out. But Pātidār hypergamy continues to flourish.

Exogamous rules are complementary to endogamous rules and they prohibit marriage between members of the same group. As mentioned earlier, in North India, high caste Hindus regard the village as an exogamous unit. Girls born within the village are called "village daughters" and they do not cover their faces before local men, whereas girls who come into the village by marriage do so.

Two other kinds of exogamy have to be mentioned: *sagotra* and *sapinda*. *Gotra*-exogamy applies in its fullness to all the "twice-born" castes. These castes have a tradition of descent from certain sages who are believed to have lived in the remote past, and two persons claiming descent from the same *gotra-r̥si*, even when they came from different linguistic areas, were forbidden from marrying each other. It may be added that several ambitious non-Brahminical castes have either claimed descent from traditional *gotra-r̥sis* or have invented new *gotras*. The Lingāyats of Mysore have *gotras* which are quite different from the Brahminical *gotras*. Gūjars, Ahīrs, Jāts and other castes in villages near Delhi have *gotras* but these are also different from Brahminical *gotras*. Often, a non-Brahmin caste which was divided into exogamous clans with each clan claiming descent from a plant or animal changed the totem names of *gotra-r̥sis*. The Hindu Marriage Act of 1955 legalizes marriage between members of the same *gotra*.

The marriage of *sapinda* relatives is prohibited among Hindus. The term *sapinda* has two meanings: (1) those who share the particles of the same body; and (2) those who are united by offering balls of cooked rice (*pīṇḍa*) to the same dead ancestors. Hindu lawgivers vary in defining the kinship group outside which marriage may occur. Gautama takes an extreme position, prohibiting seven generations (called "degrees" in Hindu law) on the father's side and five on the mother's. But several others have narrowed the circle to permit the marriage of cross-cousins; i.e., descendants from the same pair of grandparents may marry, so long as they are not parallel cousins. The Hindu Marriage Act

of 1955 bars marriage within five generations on the agnatic side and three on the mother's side. But it permits the marriage of cross-cousins where this is customary.

The observance of pollution at birth and death marks off the members of a kin-group, patrilineal as well as matrilineal. Full pollution obtains among the closest relatives; and who the closest relatives are, depends on the form of the kinship system. Broadly speaking, patrilineal relatives are regarded as closer than affinal or cognatic relatives among patrilineal castes; and matrilineal relatives are regarded as closer than patrilineal relatives among matrilineal castes.

The patrilineal joint family is an important exogamous unit among most Hindus. The enormous amount of attention bestowed on *sagotra* and *sapinda* exogamy has served to obscure this simple fact. In some parts of South India, the institution of domestic deity (*mane devaru, vittu perumāl*) serves to define the exogamous unit in the absence of known genealogical links. The institution of surname serves a similar purpose in certain other areas, though identical surnames are not always evidence of the existence of agnatic or matrilineal relationship.

With Christians and Muslims, the elementary or nuclear family is the exogamous unit. Outside of it, marriages are possible. Moplah Muslims of North Malabar live in matrilineal units and among them the matrilineage is the exogamous unit. Lineage exogamy also exists among the Muslim Gujjars of Jammu and Kashmir.

Subcaste endogamy does obtain among Muslims, even though it is not as rigid as among the Hindus. Castes at either end of the scale appear to be more particular about observing endogamous rules than the middle-range castes. For instance, generally speaking, a Syed marries another Syed, and a Shaikh another Shaikh. Sometimes, however, a Syed man may marry a Shaikh girl but a Syed girl would not normally marry a Shaikh boy. This would be against the rule of hypergamy which is occasionally practised. Hypergamous marriages occur particularly among converts to Islām from Jāt and Rājput castes. Castes which consider themselves mutually equal, such as the artisan castes, intermarry among themselves. But then castes which are considered equal in one area may be regarded as unequal in another. In Eastern Uttar Pradesh, the Darzī (Tailor) and Julāhā (Weaver) are regarded as mutually equal and intermarry, while in the western part of the State the Darzī regards himself superior and does not intermarry with the Julāhā.

The Sikhs are generally endogamous, though hypergamy does occur occasionally among castes with a tradition of hypergamy.

(e.g., Jāts) prior to conversion. The Jewish subdivisions, mentioned earlier, are endogamous. Among Pārsis, the Dastūrs (priests) accept girls in marriage from the non-Dastūrs but do not give their girls to the latter.

We have already mentioned that in South India marriage with some relatives is preferred. In the Marāthī-Telugu-Tamil-and Kannāda speaking areas, marriages with the cross-cousin and cross-niece are preferred. (Descendants of the siblings of the same sex are parallel cousins to each other, while descendants of the opposite sex are cross-cousins to each other. Similarly, a man is parallel uncle to his brother's children and a cross-uncle to his sisters' children.) Among the higher castes, however, marriage with the father's sister's daughter is not popular. But marriages with the maternal uncle's daughter and cross-niece are both preferred and such preference finds expression in ritual and custom. Horoscopes may not be consulted when a relative is being married. Among Telugu Komatis (traders) there is a strong obligation to marry the mother's brother's daughter or elder sister's daughter. The marriage of near kin helps to mitigate the conflict between mother-in-law and daughter-in-law and thereby strengthens the patrilineal joint family.

Among the matrilineal Nāyars marriage with the mother's brother's daughter is preferred. In the Nāyar kinship system, while the maternal uncle is the actual or potential head of the *tarawād*, his own children are in his wife's *tarawād*. The marriage of a man's daughters with his cross-nephews helps to continue in the next generation the link which has been forged in his generation between his natal *tarawād* and his conjugal *tarawād*. Likewise, the son's marriage with his maternal uncle's daughter continues the bond between his natal *tarawād* and his mother's brother's conjugal *tarawād*. The net result is a model in which three *tarawāds* are continually linked with each other through kin marriages. Marriage between a cross-uncle and niece, so favoured in the other regions of South India, is forbidden among Nāyars, since the maternal uncle is in *loco parentis* to his nieces (and nephews). Preferential marriage with the father's sister's daughter occurs among the matrilineal Gāros in Assam.

South Indian Jains prefer cross-cousin marriage, and the Jains of Karnātaka even practise cross-uncle-niece marriage. Muslims show a preference for marriage with the father's brother's daughter. Among the Syrian Christians of Kerala, and several other groups in South as well as North India, the exchange of brother and sister is often practised: X marries Y's sister and Y in turn marries X's sister. "Exchange marriage" circumvents the obligation to pay

dowry. "Exchange marriages" occur among the Kannadigas though they are not approved.

A traditional marriage is more the concern of two groups of kindred than of two individuals. Each kin-group has an interest in the marriage and its continuance. The head of Arranged marriages the household and his wife take the initiative in finding the bride or groom. Among the higher castes and especially the Brahmins, the parents of the girl go in search of the groom while among the lower castes it is the other way about. Among the former, a dowry has often to be paid to the bridegroom. The Nambutris of Kerala, the Cettiyārs and Brahmins of the Tamil country, the Pātidārs of Charotar in Gujarāt and the Rājputs are among those who pay high dowries. The dowry system has extended to the lower castes also. Among non-Hindus, the Syrian Christians of Kerala, Sikhs and Jains pay dowry.

In rural North India, the Barber acts as match-maker for non-Brahmin castes. Brahmin priests may also perform the role of intermediaries. In Bengal the *Ghaṭaks* were professional match-makers. The preference for marrying certain relatives in South India reduces the need for the services of a professional match-maker. The urban middle classes have started using the advertisement columns of newspapers to secure brides and grooms.

The matching of the horoscopes of the boy and girl, the exchange of gifts between the two parties, and elaborate ritual are all features of the traditional type of marriage. And the kin-group of the boy and girl have an important say at every stage of the marriage. It is only among the Westernized and urban sections of Indians that the boy or girl has a dominant voice in the choice of partner. Inter-caste and inter-regional marriages are becoming increasingly frequent among them.

Rites are a very important part of marriage and they show great variation not only from one region to another, but also within Marriage rites a single region on the basis of religion, sect, caste, income and rural-urban residence. The sacramental character of Hindu marriage is particularly evident among the "twice-born" castes and especially the Brahmins. The marriage rites include the ritual of engagement (*niscitārtha*), the fixing of an auspicious day and time (*muhūrta*) for the wedding ceremony, the reception of the bridegroom by the bride's parents (*kāśī-yatrā* and *varapūjā*), the formal seeing of the bride (*mukhadarśana*), the mutual garlanding of bride and groom, the giving of the bride to the groom (*kanyādāna*), clasping of the bride's hand (*pānigrāhanā*), circumambulation of the sacrificial fire (*agnipariṇaya*),

the offering of parched grain to the sacrificial fire (*lājahoma*), and walking the seven steps (*saptapadi*). We have only mentioned the main items of ritual which form the core round which is built an elaborate complex of rites. The rites and accompanying hymns are taken from the Vedas, Grhya Sūtras and Smṛtis. The existence of a ban on the use of Vedic mantras in the weddings of the lower castes has led to the adoption of *mantras* from the Purāṇas to accompany Vedic rites. Every wedding, whether Brahmin or Harijan, also includes ritual performed exclusively by women.

Weddings also mean processions; the feasting of relatives, castefolk and villagefolk; fireworks; and sometimes dancing by women of the Courtesan caste. Formerly, among the landowning and trading castes, marriage rites continued for three to five days and involved considerable expense. A recent tendency, among the Westernized sections, is to reduce the ritual to the minimum. An opposite tendency may be seen among the more prosperous of the lower castes; they are adopting Sanskritic ritual and custom in order to move up in the hierarchy.

It is necessary to stress that the Sanskritic and sacramental elements are minimal in the wedding ritual of some "low" castes and tribes. Among some Kerala tribes marriage "ritual" consists in nothing more than the exchange of new cloth between the bride and groom. Even among a high caste like the Nāyars, the exchange of cloth, mutual garlanding and circumambulation of lighted lamps constitute marriage. (We are excluding from our consideration the elaborate pre-marital ritual of *tālikatukalyānam*.)

The increasing Sanskritization of the "low" castes has made marriage ritual more complex among them, and has often necessitated the employment of a Brahmin or Sanskritized non-Brahmin priest. For example, the Iļavans (Tīyans) of Kerala, traditionally toddy-tappers, have accepted Sanskritization of customs and rituals, including wedding ritual, under the leadership of the late Sri Nārāyaṇa Guru. In the Punjab the Ārya Samāj has been an agent of Sanskritization, and in Gujarāt the Swāminārāyaṇa Movement has played a similar role. It is interesting to note that the most Sanskritized castes at the top are reducing ritual and becoming more Westernized.

The marriage rites of the two Jain sects, Digambara and Śvetāmbara, are identical in important respects. They are on the whole similar to Hindu marriage rites, and vary in some respects from region to region. The main rites are engagement (*vāgḍāna*, promise), the presentation of jewellery by the groom's father to the bride (*pradāna*), the giving of the bride to the groom

(*kanyādāna or varāṇa*), the groom clasping the bride's hand (*pāni-grahāṇa*) and the seven steps (*saptapadī*).

Muslim marriage rites show some variation on the basis of sect and region. Among the high caste Sunnī Muslims in Uttar Pradesh, marriage negotiations begin with a mediator approaching the bride's kin on behalf of the groom's kin. When the proposal is accepted, the sum to be paid as *mehr* to the bride is agreed upon, and a date fixed for the wedding. The groom's kin send sweets to the bride's kin. On the wedding day the groom's party goes in procession to the bride's house. The bride's parents make gifts of clothes to the groom who puts them on. Then a representative (*vakīl*) of the groom goes to the bride, accompanied by two witnesses. After obtaining the bride's formal consent, the party returns to the groom to secure his consent. The *kāzī* then recites a passage in which are mentioned all the famous marriages in the Islāmic tradition. A prayer follows and then the *vakīl* goes with the witnesses to the women's quarters where the marriage is confirmed.

The Shi'ahs differ from the Sunnīs only with respect to the ritual in which the formal consent of the bridegroom is sought and obtained. Two *mudjtahids* (priests) stand facing each other, one representing the bride and the other the groom, and one asks the other whether the party he represents has given consent.

Converts to Islām from Hinduism retain some of their pre-conversion rites. Blunt noted in 1931 that several Muslim castes employed a Brahmin priest to fix an auspicious day and time for wedding ritual. Muslim Bhāts, for instance, first celebrate marriage in the Hindu way and then in the Islāmic way.

Converts to Christianity also retain some of the customs of their former castes. For instance, the South Indian Hindu rite of tying the *tāli* by the groom to the bride is also an essential part of the marriage ritual of the Syrian Christians of Kerala.

The Special Marriage Act, 1954, provides for secular, civil marriage which may be dissolved by mutual consent. The Act applies to all Indian citizens who choose to avail themselves of its provisions, irrespective of religious affiliation. Civil marriage enables persons to avoid the expense of traditional weddings.

Reformers and writers on Indian economics have deplored the huge cost of weddings, especially among the peasantry. The amount of money spent varies according to income, caste, region, rural-urban residence and the extent of Westernization. Generally, among the patrilineal high castes, marriage means heavy expense for the bride's kin. Large sums of money, gifts of jewellery, furniture, vessels and

Marriage expenses

amount of money spent varies according to income, caste, region, rural-urban residence and the extent of Westernization. Generally, among the patrilineal high castes, marriage means heavy expense for the bride's kin. Large sums of money, gifts of jewellery, furniture, vessels and

clothes have to be offered. In some parts of the country there is a "tariff" for grooms based on education, the kind of job held, and the amount of ancestral wealth. Among some castes, however, not only is there no dowry, but the groom's kin have to incur more expenditure than the bride's kin. Among the Okkaligas (Peasants) of Mysore, for instance, the groom's representatives have to state at the marriage agreement ceremony the details of the jewellery and clothes they are going to give to the bride. A similar situation obtains among the Marāthās.

Before the Indian rural economy became monetized to the present extent, the various castes which contributed to the work of the wedding were paid in grain and cooked food. Also, ostentatious display on the part of the lower castes was not encouraged by the locally dominant caste. Nowadays, the lower castes imitate the higher freely. In several parts of India, relatives, neighbours and friends of the bridal party are required to make cash contributions, which have to be returned when a wedding takes place in each donor's household.

The social institution of marriage ensures the children born of it a recognized and legally sanctioned position in society.

Where marriage is monogamous, the husband and wife become the nucleus of a domestic group. A domestic group consisting of a man and his wife and unmarried children is called an elementary or nuclear family. The elementary family is widespread over the world, either by itself or as a part of a wider group.

It is not only in a polyandrous or polygynous marriage that the elementary family is part of a wider domestic group. Often a group of married brothers and their wives and children are found to live under a single roof under the authority of the eldest brother. Or the domestic group consists of a man and his wife, his married sons and their children. Domestic groups which are bigger than the elementary family, and often include two or more elementary families, are termed joint or extended families. They may be patrilineal, as in most parts of India, or matrilineal as among the Nayars of Kerala or the Khāsīs of Assam. Several joint families descended from the same ancestor, and acting together on certain occasions form a lineage.

In several parts of the country people live in lineage groups. Large lineages were probably more frequent during the nineteenth century than they are today. The members of the lineage lived under the same roof, or in a group of neighbouring houses, held property together, and ate together. Such a lineage formed a coparcenary, every member

Lineages as corporate groups

(male in the case of a patrilineage and female in the case of a matrilineage) having a share in the ancestral property. Among some groups, including the Nāyars, Nambutris and Kodagus ancestral property was traditionally imitable. Over a hundred years ago, village headmen in Bundelkhand periodically redistributed the arable land among the lineages of the dominant land-owning castes. (The same was true of the Pathāns of the North-West Frontier Province.) In the Thanjavūr District it was common for arable land in a village to be owned by members of a patrilineage who were called *pangāli* (sharers).

The matrilineage of the Nāyars is called *tarawād* and it consists of all the descendants, in the female line, of an ancestress. A Nāyar household may include a woman, her brothers and younger sisters, her children, and her sisters' children and her daughters' children and her sisters' daughters' children. The Nāyars are not a single caste but a group of castes divided into high and low, and some of the high caste Nāyars owned land while the others held land on the twelve-year *kāṇam* lease from those (Nambutris or Kṣatriya Nāyars) with a superior title to land. The lessees in turn sublet land to tenant cultivators on a three-year tenure.

In pre-British Kerala, Nāyars formed the soldiery of the Zamorin of Calicut, the Rājās of Cochin and other local rulers. Nāyar men either remained in the villages, looking after land, or stayed in a prince's court as soldiers. Except in North Malabār a Nāyar girl was not required to leave for her natal home on marriage. She continued to stay with her sisters, brothers, mother and mother's brothers and sisters. The husband was only a visitor and the children born of the marriage were regarded as members of the mother's natal *tarawād*. The oldest living male was the manager of the *tarawād* and it was his duty to look after its property which was considered imitable. The members lived in the ancestral home, situated on the ancestral estate, which included a sacred serpent-grove (*kāvu*) and even cremation ground. The *tarawād* was a corporation which continued in perpetuity.

Nambutri Brahmins lived in patrilineages which were called *illam*. The Nambutri house, like the Nāyar house, was situated on the ancestral estate, and near it were the serpent-grove and cremation ground. The Nambutris were landowners and their land was leased to Nāyars on *kāṇam* tenure. Land was considered imitable, and imitability was ensured by the rule of primogeniture. Only the eldest son was permitted to marry a Nambutri girl and the younger sons had liaison (*sambandam*) with girls belonging to the higher Nāyar castes. The younger sons visited their partners at night and the children born of the union became

members of their mother's *tarawāds*. The Nambutri *illam* consisted of a man, his wife or wives, his children, and his younger brothers. Sometimes the *illam* included his old parents or his eldest son's children.

The *okka* of the Koḍagus resembled the Nambutri *illam*. It consisted of all the descendants, through males only, of an ancestor and their wives and children. The oldest living male was usually the head of the *okka*. The *okka* house was situated on the ancestral estate, and until 1840 land was regarded as imitable. Just as primogeniture helped to ensure the imitability of land, the institution of leviratic alliance helped to contribute to the unity of the *okka*. The members of an *okka* regarded the spirits of dead ancestors (*kāraṇavar*) with reverence and periodically propitiated them.

Among the poorer and uneducated folk in rural areas, the residential groups generally tend to be small, being confined to

Joint and elementary families members of the elementary family and one or two other relatives. In this section of the population, the family group holds together during the father's life-

time, partition being usual after his death. Among the richer rural folk and among the urban-educated, joint families tend to be more frequent. A joint family consists of a man, his married sons and their wives and children, and his unmarried daughters. A joint family may persist even after the father's death, the eldest son becoming the head in place of the dead father. Occasionally a widowed sister or daughter and her children may be part of the joint family. An affinal relative of the head may also be living in a joint or elementary family.

The members of a joint family live under the same roof, eat from the same kitchen, perform their rituals together, and their common expenses are met out of the income of the ancestral estate. Every joint family has a manager who takes decisions on behalf of all. Every male member has a vested interest in the ancestral property. Some joint families are big, having as many as twenty or thirty or more members, while others are small. In the former case, it is usually found that members of three different generations are living together. In the latter, the joint family may consist of an elementary family and one or two additional relations such as a younger unmarried brother or sister or nephew or niece of the head of the household.

A joint family loses members through marriage of its girls and through death, and gains members through marriage of the boys and through birth and adoption. Sometimes a woman returns to her natal joint family after the death of her husband. A joint family splits up into constituent elementary families when partition

occurs. But partition is a periodical process, the elementary families resulting from partition in time developing into joint families. Joint and elementary families are parts of a single cyclical process and failure to perceive this fact has resulted in much misinterpretation of facts.

The composition of a joint family depends upon the mode of descent and the pattern of residence general to a group. Descent may be patrilineal or matrilineal or cognatic, and residence may be virilocal (staying with husband) or uxorilocal (staying with wife) or neolocal (both moving to a new house). Matrilineal descent does not always mean uxorilocal residence. In North Malabar descent is matrilineal but residence virilocal. A woman moves into her husband's house after marriage and the children born of the marriage stay with their parents till they reach adulthood and then they move into their mother's natal *tarawād*. The composition of a *tarawād* in North Malabar may be similar to that of a patrilineal joint family, but the juridical rights of the members living in it are entirely different.

Virilocality is the general rule in India, and this is not confined to Hindus but extends to Muslims, Christians, Sikhs and Jains. The wife joins her husband soon after marriage and the latter generally lives with his own parents and brothers. It is only later, after the death of the parents, that the brothers separate from each other. Even this may not happen and the brothers may decide to stay together. Among the poorest groups and the lowest castes, the family breaks up soon after the parents' death. Among the highly Westernized and urban sections, neolocality is coming to be the rule. But the establishment of a new home does not mean the severance of ties with kin-groups of the husband and wife. Kinship connections are recognized on both the sides, and a close relative on either side may live with the couple. It may be added here that in recent years spatial mobility has increased considerably and young men have jobs away from their natal towns. This means that in urban areas there are many families which are seemingly elementary.

The female members of a Nāyar *tarawād* receive their husbands at night, while the male members go to their wives. So there is variation in the diurnal and nocturnal compositions of the Nāyar *tarawād*. The custom of visiting wives and choice of place of residence is a complicated matter. Nowadays, in urban areas, patterns of residence are changing towards virilocality if not neolocality.

The Khāsi of Assam are also matrilineal but the pattern of residence obtaining amongst them is somewhat different from that

amongst the Nāyars. Marriage is followed by matrilocal residence which lasts till a child is born, the couple then moving into a new house. But if the wife is the youngest daughter of her mother, the couple continues to stay in the wife's natal household permanently. A form of ultimogeniture seems to prevail amongst the Khāsis. Among the Gāros also, residence is uxorilocal.

While the composition of a household is usually determined by the particular principle of descent and the type of post-marital residence obtaining in a caste, the bilateral principle finds greater recognition than is commonly thought. A household may include not only patrilineal relatives such as two full brothers, their wives, their children and unmarried sisters, but also the brother or sister of a wife of one of them. In a matrilineal household, on the other hand, increasing recognition of the bilateral principle may result in the parents of either the husband or wife residing with the couple. It may be added that, among the urban and educated sections of the population, the household consists of the husband, wife, their children and a relative of the husband or, less frequently, a relative of the wife. These households are justifiably considered as part of wider kinship groups elsewhere. In big cities like Bombay and Calcutta high rents act as a limiting factor on the size of the household.

In the traditional Hindu joint family the senior male, either father or eldest brother or son, was usually the head of the household. It was his duty to look after the property, meet the expenses out of the income of the ancestral estate, and clear the debts. He was expected to keep the estate in good order and manage the resources carefully. The education of the younger members, the marriage of adults and the expenses of funeral ceremonies for the dead were all legitimate charges on the ancestral estate. The head of the household was the manager of the joint family corporation and as such he wielded much power and authority. The members were expected to obey him in all matters. Even today in rural areas the head of the household tells everyone, including the adult members, what they should do during the course of the day. The head is respected in proportion to his impartiality and concern for the common good of the family.

General principles of the social structure, such as differentiation on the basis of sex and age, regulated relationship between members of a joint family. Differentiation on the basis of sex resulted in intensifying social interaction among members of the same sex and correspondingly weakening interaction between the different sexes. A married girl, for instance works in the kitchen with her mother-in-

Behaviour pattern in joint families

law and sees her husband only at night. In Western Uttar Pradesh, to give an instance, the house of a rich landowner comprises two parts; one, where women cook and sleep; the other, consisting of a raised platform and a room or two, where the men meet their friends and smoke the *hukkā*. Cattle are parked in the men's *caupāl*. At caste or village dinners men and women dine separately; women take their turn after the men and children.

Age is another operative principle, the younger members being required to show respect to the elder. In formal greeting, obligatory on ceremonial occasions, the younger person is expected to place his head on the elder's feet. The distinction on the basis of age cuts across the distinction on the basis of sex—a young man is expected to salute and take the blessing of an old female relative. When an exception is made, it only serves to emphasize the rule. Among the Kodagu, while generally young people have to show deference to the old, a wife must salute her husband's younger brother by touching his feet, even when he is younger than her. Formerly there was a general preference for leviratic marriage among the Kodagu; the younger brother often became the husband of his elder brother's widow. And as between husband and wife, the former has to be treated as superior.

Respect for age resulted in power and privilege being concentrated in the hands of elders. Generally the male head of the joint family was the oldest living agnate, and the female head, his wife. The one exercised authority over men, the other over women. Difference in generations meant only an accentuation of age difference. But sometimes, thanks to early marriage, a man is younger than his elder sister's or brother's children. In such cases there is a conflict between the two principles.

We have already described the relations obtaining between the head of the joint family and the other male members. Where the head is the father of the older male members, his authority as head is reinforced by the general rule which requires sons to obey their parents and especially the father. When the eldest brother succeeded to the father's position as head of the joint family, the younger brothers had to obey him as they did their father. The position of the eldest son as the future head of the family marks him off from the other sons who are taught to respect him from an early age. This is specially true of the richer sections and higher castes. It is to be noted, however, that this transfer of authority from father to eldest son is only partial. Here is one of the reasons why families generally split up after the father's death.

Ideally, the children in a joint family are the children of all

the male members of the parental generation, and discrimination by a parent in favour of his own children is regarded as reprehensible. The different units of the joint family pose a potential threat to its continuity, and as long as the joint family exists the units are subordinated to the bigger entity.

The relation between women members in a joint family is frequently one of conflict. The mother-in-law and daughter-in-law relationship is celebrated in folklore for the intensity of its conflict. Relations between a woman and her husband's sisters, and between her and her husband's brothers' wives, are also conflict-ridden. The basic fact of rivalry between brothers (or sons) and the conflict between women lead to the splitting up of the joint family. In North India a man has a friendly and even joking relationship with his elder brother's wife and a formal one with his younger brother's wife. In South India a man treats his wife's younger brothers and sisters with familiarity. The relation between a man and his parents-in-law is a formal one and only gradually, with the lapse of time, does it become less formal.

Nowadays, traditional patterns of behaviour are yielding place to new ones over a wide area. For instance, educated daughters-in-law do not obey their mothers-in-law as completely as before. There is a wide cultural gulf between the old-fashioned mother-in-law and the educated daughter-in-law and this, as may be expected, is a constant source of friction.

The principle of differentiation on the basis of age and sex holds good in matrilineal systems also. Respect is paid to older relatives and strict segregation is the rule between the sexes. The women confine themselves to a particular part of the house. Sisters have an "avoidance relation" with their brothers (including parallel cousins) and especially the eldest brother, the future head (*kāranavan*) of the matrilineal household.

Uxorilocality, polyandry and easy divorce in the traditional kinship system of the Nāyars were all intended to strengthen the sibling bond and weaken the conjugal bond. The head of the *tarawād* was expected to treat his sister's children as his own and be indifferent to his own children. The changes which have occurred in recent years have strengthened the father's position at the expense of the maternal uncle's.

A joint family is bound together by periodic propitiation of the dead ancestors. Among Brahmins this happens at the *śrāddha* ceremony, where a man propitiates his dead father's ritual bonds or mother's spirit (*pitrū*) by offering it *pinda*. The dead person's parents and grand parents are also propitiated at a *Śrāddha*. Among non-Brahmin castes ancestor

propitiation takes different forms. Highly Sanskritized non-Brahmin castes, including the Kṣatriya and Vaiśya, perform the *śrāddha* ritual. On the west coast of India, groups with a developed lineage system such as the Nāyar and Coorg have elaborate ancestor propitiation in which the spirits of the dead "possess" low caste oracles. Where lineages are not so developed, all the dead ancestors are propitiated collectively on a particular day. A favourite period for the propitiation of ancestors is the fortnight preceding the *Dusserah* festival, known as *pitṛu pakṣa* (ancestors' fortnight).

In many parts of South India a joint family or lineage has a tradition of worshipping a particular deity. Vows are made to this deity in times of trouble, and the first tonsure, the donning of the sacred thread, and the marriages of the members of the client-family are celebrated in or near the deity's temple. Śrinivāsa of Tirupati and Subrahmanyā of Palni are two well known deities who have innumerable families attached to them.

Another important bond is pollution. When a member of a joint family or lineage dies, pollution has to be observed, the maximum period being ten days for the upper castes. Birth also results in pollution up to a maximum of ten days for the upper castes. The pollution group always includes the members of the joint family, patrilineal or matrilineal. It may be noted that the bonds created by the worship of family deities and ancestors and by the observance of pollution persist even after a joint family has split up into its component units or are residing in different places.

The political, economic and ideological forces that were released during British rule brought about certain changes in the joint family system. Large kin-groups, in rural areas Changes in joint at any rate, had been confined to a few landowning family high castes. Residence in the same village, absence of economic differentiation between the different members of the joint family and the difficulty of getting the caste or village panchāyat to agree to partitioning the joint family had been factors which kept the institution as a going concern. British rule altered that situation. The new economic opportunities which came through the link-up of the local economy with a much wider one increased monetization; and greater opportunities for trade and increased spatial mobility due to the building of roads and railways led to the emergence of smaller kin-groups. The rapid growth of population with the resultant pressure on land was felt especially at the lower levels of the rural economic order. The Hindu Gains of Learning Act, 1930, declared that property acquired by a Hindu

as a result of his education was his personal property, even though his education was paid for by his joint family.

While the forces mentioned above certainly operated against living in big joint families, it must be remembered that the rural poor probably always lived in kinship groups which were not very much bigger than the elementary family. Living in big joint families is generally associated with wealth from land or trade or industry. It seems likely that the family pattern of the rural poor did not undergo as serious a change as that of the comparatively rich. Even among the latter, the cost of education and increased mobility did contribute to strengthening joint family links. The earners in a joint family often made higher education possible for the younger members even when they themselves were uneducated. Residence away from the natal kin-group removed the stresses and strains of day-to-day living, while increased communications kept the links alive. This is borne out by recent studies supporting the conclusion that the urban family is larger than the rural family.

Even if figures for urban areas show a dwindling in the size of the family, it does not necessarily mean that the joint family system is breaking down. Urban families are frequently not autonomous entities but only limbs of bigger families situated elsewhere. Any crisis in the parent or offspring family will be faced as a common problem. Weddings, funerals and other ceremonies are usually celebrated in the "parent" household. There is occasional transference of persons from one to the other family.

Generally speaking, in the matter of succession to a traditional office, the rule of primogeniture is observed. That is, the eldest

Succession and inheritance son of the incumbent of an office succeeds to it on the death of the latter. The eldest son becomes priest

or headman or village watchman in the areas where those posts are hereditary. Sometimes the office may be split up like property among the sons of the office-holder. In parts of Gujarāt, for instance, the hereditary headmanship of a village rotates among the different branches of a lineage, each of which has a share in the office. The principle of splitting up a hereditary office is not, however, as widespread as primogeniture.

Among the matrilineal Nāyars, the managership (*kāranavan*) of the *tarawād* passes from maternal uncle to nephew. Among the matrilineal Khāsis, the office of the priestess of the matrilineage devolves on the youngest daughter (*ka khadduh*) of the incumbent.

All Hindus are patrilineal, with the exception of the Nāyars and Bants and other castes on the West Coast and Khāsis and Gāros of Assam. Muslims, excepting the Moplahs of North Malabār, and Christians, excepting Khāsi converts, are patrilineal.

All Jains, Buddhists and Sikhs are patrilineal. But even among the patrilineal groups some movable property is given to daughters and this property shows a tendency to devolve matrilineally. *Stridhana*, gifts made to a bride (in contrast to the dowry), devolve eventually on her daughter. Again, the fact that women (until recently) did not inherit immovable property in patrilineal households was compensated for by their possession of rights in two households, natal and conjugal. Among the matrilineal Nāyars, on the other hand, the women inherited the immovable property while the men managed the *tarawād* property.

Patrilineal Hindus were (and still are, to some extent) governed by two main schools of law in the matter of succession and inheritance, viz., the Mitāksara and Dāyabhāga. Founded by Vijnāneśvara and Jimūtavāhana respectively, they flourished in the 11th-12th centuries A.D. There were other schools which varied slightly from the Mitāksara. The Mayūkha school is followed in Bombay, Gujarāt and North Konkan; the Mithilā school in Bihār; and the Vārānasi and Madras schools in their respective areas. We shall confine ourselves only to the chief differences between the Mitāksara and Dāyabhāga schools. The Dāyabhāga school is followed in Bengal and Assam. Under the Mitāksara, a son has a vested interest in his father's ancestral property from the moment of his birth. The father cannot alienate any part of the ancestral property to the detriment of a minor's interest. Buyers hesitate to buy ancestral property when the seller has a minor heir. Under the Dāyabhāga system, however, the father is the absolute owner of his share and the presence of a minor son does not constitute a bar to alienation. The term *sapinda* refers in the Mitāksara school to all relatives who are bound by ties of flesh and blood (particles of a single body), while in the Dāyabhāga it refers to relatives bound by the ritual offering of funeral cakes. This difference results in certain non-agnatic kin being given preference over agnatic kin in the Dāyabhāga school: the sister's son, father's sister's son and father's father's sister's son are included in the list of heirs and take precedence over some agnates.

In the matrilineal system of inheritance, a person inherits from his maternal uncle and not from his father. Amongst the Nāyars the father had no obligation to maintain his wife and children, who belonged to a different *tarawād* from his. Property descended from a mother to daughters. The men only managed their sister's or mother's property. The Marumakkattayam Act of Malabār, 1933, gave the children of a man the right to inherit his self-acquired property. (A similar Act had been passed even earlier in Travancore and Cochin.) Even the self-acquired property of a man did

not, however, go to his son's children but to his daughter's children. Until 1956, when the Hindu Succession Act was passed, there were two systems of inheritance in Malabār: the *tarawād* property which devolved matrilineally, and the self-acquired property which devolved on the children of a man and his daughter's children. The Hindu Succession Act and the Hindu Adoptions and Maintenance Act, 1956, make the husband legally responsible for the maintenance of his wife and children.

All Muslims excepting matrilineal Moplahs are governed by the Shariat Act of 1937. Under Islāmic law, the mother, wife and daughter are the three female heirs. The maximum share of the mother is one-third and the minimum one-sixth, depending on the existence or otherwise of other heirs. The share of the wife is one-fourth or one-eighth, depending on the absence or presence of a child, or child of a son. The wife is also the owner of the *mehr* given to her at wedding. She is also entitled to be maintained by her husband. The daughter is a primary heir like the son. Her share fluctuates, depending upon the number of surviving children. The daughter's daughter, however, does not stand on a par with the son's daughter.

The Hindu Succession Act of 1956 governs the inheritance of Hindus, Buddhists, Sikhs and Jains. It applies to both matrilineal as well as patrilineal groups. According to this Act, Recent changes the property of a Hindu dying intestate devolves on his sons, daughters, widow and mother. But in the Mitākṣara school the shares of the female heirs extend only to the share of the deceased in the coparcenary property. Another change introduced by this Act is the inclusion of the mother in the same category of heirs as the widow and children of the dead man.

#### 4. Conclusion

Recent changes in the social structure may be discussed under the following heads : (i) caste in modern India; (ii) changing rural and urban life; and (iii) changes in the position of women.

Dr. Bailey's study, *Caste and the Economic Frontier* (1958), provides a good example of the kind of changes which came in the wake of British rule. In Bisipara, a village in Caste in modern Khondmāls in Orissa, two non-landowning castes, India made money because they could get a monopoly of the profitable trade in hides and liquor. It would have been polluting for the higher castes to handle liquor or hides. Of the

two castes one was able to raise itself up in the hierarchy by Sanskritizing its ritual and way of life; the other, found that untouchability came in the way of its mobility.

The dissociation between caste and occupation is greater in the towns than in the rural areas, and much greater in the big, industrialized towns. A number of occupations have come into existence in the big cities and these are, to some extent, "castefree". For instance, several castes, including Brahmins, are found driving taxis in Indian towns.

The policy of giving preference to Harijans in appointment to Government posts has helped in breaking the traditional association of that caste with agricultural labour, sweeping and leather-work. In one taluk of Mysore State, for instance a majority of the teachers in the primary schools are Harijans.

While the association between caste and traditional occupation has been disturbed to some extent, the fact that high castes had a literary, commercial or military tradition has resulted in their dominating the liberal professions, the higher posts in the government and the army, and the new commerce and industry. At the other end, the urban proletariat consists, by and large, of the "lower" castes. The Camār repairs shoes in a small shop, or works as a labourer in a shoe factory, the Dhobi in an urban laundry, the Darzi in a tailor's shop, the Nāi in a "hair-cutting saloon" and so on. There is a modicum of continuity between rural and urban hierarchies. Opportunities for social mobility are greater in cities than in villages. An industrious, shrewd and lucky Camār may in course of time become an owner of a small shoe factory and the Dhobi of a big laundry.

The idea of hierarchy is central to caste. The customs, rites and way of life were different among the higher and lower castes.

<sup>Sanskritization and Westernization</sup> The dominant caste punished those who encroached on forbidden ground, but the process could not be stopped. This adoption of the symbols of higher status has been called Sanskritization. The Liṅgāyats of Mysore Sanskritized their way of life over eight centuries ago. In recent times, Sanskritization has been widespread both spatially as well as structurally. The Ilavans of Kerala, the Smiths of South India, the Rāmgharias of Punjab, the Camārs of Uttar Pradesh and many other castes have all tried to Sanskritize their way of life. Liquor and forbidden meals are given up. Sanskritic ritual is increasingly adopted and there is an increasing demand for the services of a Brahmin priest at wedding, birth, funeral rites and śrāddha.

On the other hand, the higher castes, especially those living in the bigger cities, are undergoing a process of Westernization.

Westernization, like Sanskritization, is a blanket term: it includes Western education as well as the adoption of Western ways of life and outlook. It also implies a degree of secularization and rationalism, and in these two respects it stands opposed to Sanskritization. In certain other respects, Westernization helps to spread Sanskritization through the products of its technology—newspapers, radio and films.

In some exceptional cases, the lower castes and tribes are being Westernized without undergoing a prior process of Sanskritization. Again, Sanskritization occurs generally as part of the process of the upward movement of castes while Westernization has no such association. In fact, unlike Sanskritization, Westernization is more commonly an individual or family phenomenon and not a caste phenomenon, though some groups (Kodagus) and some areas (Punjab) may be said to be more Westernized than the others. Again, some groups may be more Westernized in the sense that they are highly educated, whereas some others may be Westernized in their dress, food habits and recreation.

Hypergamy, a manifestation of the hierarchical aspect of caste, is becoming less popular in certain parts of the country. Kulīn hypergamy has largely disappeared. A movement is afoot among the Nāyars to marry within caste and endogamy stop giving girls in *sambandam* to Nambutri men. Correspondingly, Nambutri leaders look down upon *sambandam* and encourage the younger sons to marry Nambutri girls. In Gujarāt, however, hypergamous marriages continue to be popular with Pātidārs and Anāvils, though perhaps not to the same extent as before.

We have already commented on the importance of pollution in maintaining the structural distance between the various castes.

Pollution and privileges Pollution rules are much less strictly observed in cities than in villages. In fact, in certain areas of urban life pollution has ceased to have any application. People mix freely in factories and schools, and very few bother about the caste of fellow-passengers in train and buses. In cities pollution is being increasingly confined to the house, to women and to ritual occasions.

In older days the higher castes regarded contact with the lower castes as polluting, and the latter were also subjected to some disabilities. For instance, the lower castes were not allowed to build tiled houses, wear the clothes which the upper castes wore or take out wedding processions in streets inhabited by high castes. Punishment for an offence varied according to the caste of the persons who committed it and against whom it was committed. Mahatma

Gandhi roused the conscience of educated Indians about the practice of untouchability. Apart from the injustice, educated Indians realized the political dangers of trying to deny the basic conditions of decent living to large numbers of people on the ground of birth in a particular caste. It is this awareness that has led to the adoption of various measures in Independent India to put an end to untouchability and to enable the Scheduled Castes and Tribes to advance to the level of the high castes. The grosser expressions of untouchability have disappeared in the cities, but in rural areas it still holds sway. The economic emancipation of the Harijans and their increased migration to urban areas are necessary for the complete eradication of untouchability.

The British not only introduced a new body of legal ideas (including that of equality before law) but also new procedural methods. Some of these were not understood by Caste panchāyats the litigants, the bulk of whom were illiterate. The language used in the higher courts was English and there was a hierarchy of courts, the higher court occasionally reversing the decision of the lower—that deepened the mystery of the new legal processes. Justice seemed to the peasant a gamble in which the rich had a better chance than the poor—they hired the cleverer lawyers and moved from one court to another. The British lawcourts greatly reduced the power of the panchāyats, but the latter continued to function. Even today people take a variety of disputes to the elders and abide by their decision. Occasionally, a case pending before a lawcourt is withdrawn and submitted to the panchāyat.

In the last few decades, with the great improvement in communications, castes have shown a tendency to extend the area of their operations. The settlement of an intricate caste dispute or the defence of a caste interest might call forth a meeting of the representatives of the concerned caste from fifty or more villages. Sometimes, several endogamous *jātis*, all belonging to the same level (e.g., all the untouchable *jātis* in an area) might come together to fight for a privilege or a right, while to decide an accusation of adultery with a person of another caste the elders of a single endogamous unit or the two concerned units may come together. Castes have shown much organizational ability in meeting the challenge of new social, economic and political situations. This brings us to the functions of caste in modern India.

The new activities which castes have undertaken may be considered under four heads: reformist and philanthropic; educational; economic and political. One of the results of British rule was to

make sensitive and intelligent Indians critical of their own society and some of its institutions. Many political leaders of all-India Functions of caste : stature were also earnest social reformers. Meetings Reformists of castes such as Kāyasthas took place and passed resolution on a variety of matters. Caste newspapers, journals and conferences had as their main aim the safeguarding of the interests of the caste in the context of the new situations which British rule had brought about. In the towns there came into existence caste hostels, hospitals, banks, orphanages, co-operative societies and organizations undertaking a variety of charitable tasks for a particular caste. Matters such as the age of marriage of girls, girls' education, high dowry, widow remarriage, high cost of wedding and funeral ceremonies and many other matters were discussed in caste conferences. Concessions and privileges in education and appointment to government jobs were demanded for the caste from the Government. On the one hand, there was an attempt to argue that a particular caste was backward and that concessions were necessary to enable it to catch up with the advanced castes. On the other hand, the Sanskritization of the customs, manners and way of life of the caste was advocated to claim a high place for it in the ritual hierarchy. Backwardness was claimed in a secular context and a high status in a ritual context.

Educational activities Some Indian towns have hostels for the locally important castes. The great peasant caste of Okkaligas of Mysore, for instance, collect during the harvest a grain contribution from every landowner in the Mandya and Mysore Districts, and this is sent to Okkaliga hostels in towns. Scholarships have been endowed for which only members of a particular caste are declared eligible. All over India even the middle-range castes have realized the importance of education and consequently there is keen competition to secure opportunities for education at all levels for members of their castes. Nowadays, State Governments discourage caste hostels and give grants only to "cosmopolitan" hostels.

Economic functions Castes with a literary tradition were the first to take to Western education, and this naturally meant that they dominated the liberal professions and higher posts in the Government. These castes did not exploit the new commercial opportunities because of an initial resistance against trade. It is only when the kind of jobs they preferred became very difficult to secure that they entered trade and commerce. Even the traditionally commercial castes could not trade in certain articles : we have already mentioned how in Orissa two low castes

made money out of trading in liquor and hides, articles which the high castes would not handle. On the other hand, Brahmins in South India took to restaurant-keeping not only because cooking was their traditional occupation but also because food cooked by them is acceptable to all. In Mysore, the Lingāyats also took to hotel-keeping since food cooked by them is acceptable to most non-Brahmin castes.

We have already mentioned co-operative societies formed on the basis of caste. The Sāraswat Housing Colony in Bombay is an example. The Nāṭṭukottai Cettiyārs of South India, a trading caste, have built a co-operative banking organization. There are other caste banks in South India—the Vyśya Bank, Kaniyara Bank and Mandyam Bank are instances.

We have earlier mentioned that British rule set in motion a number of forces which facilitated the horizontal organization of castes. This was specially true of the lower castes which felt that the higher castes, thanks to their education along Western lines, had obtained a near-monopoly of the higher posts in the Government, of the liberal professions, and of positions of power in local self-government. The British admitted their demand for concessions and privileges as reasonable. In the former Bombay State, for instance, castes were classified as backward, intermediate and advanced and the first two were given preference in appointment to official posts. They were also given representation in local self-governing bodies.

Political functions

In Madras the Justice Party was founded in 1917 to promote non-Brahmin interests. The party co-operated with the British to form the government in the Madras Presidency under the Government of India Act of 1919. At this time the Congress was fighting the British. In the inter-war period the Congress, under Mahatma Gandhi's leadership, succeeded in winning the masses to its side, and in the 1937 elections it swept the polls in large areas of the country, including Madras. The Justice Party suffered heavily. This did not mean that "casteist" parties suffered a permanent defeat. The Drāviḍa Kalagam, which aims at creating a State of Dravidian-speakers, is still active in Madras. It is anti-North, anti-Hindī, anti-Brahmin, and atheistic. The Drāviḍa Munnetra Kalagam owes its birth to personal and ideological differences between the leaders of the Drāviḍa Kalagam. The D. M. K. seems to be more alive to economic issues than the D. K. It is certainly more popular than the D. K. It won 50 seats in the Madras Legislative Assembly at the 1962 General Elections.

The gradual transfer of power from the British to the Indians

has been accompanied by an increased activity of caste in the political sphere. In its simplest manifestation this shows itself as the tendency to vote for a man of one's own caste, other things being equal. Nowadays, all political parties try to put up candidates belonging to the locally preponderant castes. The Communist Party of India calls this "social base", and makes sure that the candidates it puts up have a "social base".

Caste considerations influence politics in other ways as well. In Mahārāshtra the Konkānastha Brahmins were the first to become Westernized and they dominated the political arena for several decades. (There was also a non-Brahmin movement in Mahārāshtra, and in the early years of this century the Mahārājā of Kolhāpur played a leading part in it.) In 1948, a large block of the Mahārāshtra Congress left the party to form the Peasants and Workers Party. According to Miss Maureen Patterson, this was "both an attempt to protest against what was considered the overtly 'capitalistic' domination of the Congress and to bypass what was claimed to be continued Brahmin control over positions of leadership in the Mahārāshtra Congress organization".\* Selig Harrison writes that the rivalry between the two dominating land-owning castes, Kammas and Reddis, "is only a modern recurrence of a historic pattern dating back to the fourteenth century".† In 1955, the Kammas were predominantly in the Communist Party while the Reddis were in the Congress. Even during the "violent phase" of the Andhra Communist Party, Kamma landlords were spared by the Communists while the other landlords were not. In the Mysore Congress today, rivalry between the Okkaligas and the Lingāyats is a well known fact, and it influences in one way or another every important decision. The opposition of the Mysore Okkaligas to the formation of a Kannada-speaking State inclusive of North Karnātaka, Coorg and South Kanara was due to their fear of domination by the Lingāyats, the largest single caste in the new State.

It is not only in the South that caste finds expression in politics. Gujerāt, Bihār and Uttar Pradesh show evidence of caste-activity in political parties and elections. The 1957 elections provided positive proof of the active part played by caste. In March 1957 the Congress Working Committee expressed its deep alarm at the rise of communal, caste and subcaste feelings in the country.

The new opportunities which we have referred to increased

\*"Caste and Politics in Maharashtra," *Economic Weekly*, Sept., 1954.

\*\*"Caste and the Andhra Communists," *American Political Science Review*, June, 1956.

caste consciousness and inter-caste competition. In South India, this was accompanied initially by anti-Brahmin sentiments. In other parts of the country there was opposition and hostility to the caste or castes which enjoyed a dominance in government jobs, professions, and commerce and industry.

Caste and conflict

Nowadays, in the South, there is a struggle between the locally dominant castes for a larger share of power and pelf. The process of democratic decentralization (*Panchayati Rāj*), and Community Development and allied programmes have all benefited the locally dominant castes and not the poorer and smaller castes. In fact, the position of the latter has worsened because of increased pressure on land. The Harijans, for whom the Government is trying to do a great deal, feel that they are far from being equal, economically or otherwise, to the high castes. They have been pressing for the continuation of constitutional safeguards for a further period of six years (till 1970). The high castes, on the other hand, resent the privileges given to the Harijans.

The land reform measures have increased the tension between landowners (generally belonging to high castes) and tenants. Even within a caste, they have set the poor against the rich. The attempt by the Harijans to assert their rights has often resulted in fighting, bloodshed and arson. The anti-Brahmin riots in Mahārāshtra after the assassination of Mahatma Gandhi, the rioting in Rāmanāthapuram in Madras in 1957 and the clashes elsewhere between the Harijans and the high castes provide evidence of the underlying tensions in rural areas.

We have earlier made the point that there is a broad coherence between the caste hierarchy and the economic hierarchy, and this coherence continues to exist in the towns and cities.

Caste and class

Where there is inconsistency between ritual and economic status, two consequences are possible: if the ritual status is high while the economic status is low, the gap between the two can exist for a long time. But when the economic status is high and the ritual status low, the latter tends to adjust itself to the former. Such a tendency has been inherent in the caste system for a long time.

It is true that industrialization and urbanization weaken the hold of pollution ideas. Western education has resulted in the spread of a liberal, democratic and secular ideology among the Indian intelligentsia. The advent of universal adult suffrage abolishes the distinction between high and low as far as voting is concerned. The Congress, Communist and Samyukta Socialist Parties have all accepted the creation of a "classless and casteless society"

as their ultimate goal. But the formulation of a goal is not the same thing as making a sustained and systematic effort to realize it. Neither the traditional institutions nor the ones created under the British rule show a consistent movement towards egalitarianism. What is now coming into being is a new type of stratification in which caste and class are mixed up in an inextricable tangle.

It must be stressed here that the formulation of the goal of a "casteless and classless society" by the principal political parties  
 The Future is an important event. The measures undertaken  
 to abolish untouchability constitute a definite advance  
 towards a more egalitarian society than before. The various measures designed to help the Backward Castes have enabled at least the middle-range dominant castes to come up. But it is also true that the latter have a vested interest in keeping down the Harijans and other low castes who supply them with tenants and agricultural labourers. Devolution of power has added to the power of the locally dominant castes and this has enabled them to collar the benefits of Community Development and other rural welfare programmes. Indian society today is stratified along the lines of caste as well as class. The desire to bring about an egalitarian society is no doubt there; but it needs a systematic programme of action spread over a long period of time if inequalities have to be reduced appreciably. The task of transforming the most rigidly stratified society in the world into an egalitarian one is indeed Himālayan.

Rural society is undergoing changes and they may be considered under the following heads: industrialization;  
 Changing rural and urban life urbanization; and political and administrative changes.

During British rule, Indian economy became a "colonial" one—geared to subserve the needs of the developing British economy.  
 Industrialization The beginnings of industrialization also occurred during British rule. These facts adversely affected some artisan castes and especially the Weavers and Potters, many of whom were faced with the prospect of joining the growing ranks of landless labourers and tenants or migrating to towns. Villagers became increasingly dependent on nearby towns for many goods and services. The growing of commercial crops such as cotton, jute, tea, coffee, indigo and tobacco brought cash to the village and made village economy and society sensitive to changes in the external demand for these commodities. In those villages where the growing of commercial crops became the major concern, *jajmāni* relationship tended to disappear.

When the new economic opportunities benefited the higher

castes, the gulf between them and the lower castes widened still further. When they benefited the lower castes, the latter tried to move up in the hierarchy and this increased caste consciousness.

Traditionally rival patrons competed with each other for land, clients and women. With the establishment of British rule, seeking the favour of officials became very important. Nowadays, patrons compete with each other to start rice and flour mills, operate bus lines, and become *sarpanch* and secretaries of co-operative societies. Urban political leaders cultivate rural patrons for votes at elections.

Over the last hundred years migration from villages to towns has been steadily increasing. The "push" factor has been probably more important than the "pull" factor in this:  
 Urbanization the increased pressure of population on land has driven the most vulnerable section of rural population, the poorer tenants and landless labourers, to the cities and plantations. ("Dry" or non-irrigated areas have been more vulnerable to such pressure than "wet" or irrigated areas.) For instance, the textile mills of Bombay have attracted large numbers of Mahārs, a Harijan caste of Mahārāshtra, as also Muslim Julāhās (Weavers) from Uttar Pradesh. The towns also beckoned the higher castes who saw in them the means of obtaining Western education, without which well-paid and prestigious jobs could not be secured. The trading castes and the artisans migrated into towns in search of new opportunities.

The city not only provides employment but also it changes the way of life of the rural people living in its hinterland. Nearby villagers take to dairying, poultry-keeping and market-gardening to supply the urban demand for milk, fruit and vegetables. The villagers make use of the medical, educational and recreational facilities available in the city. More money circulates in the nearby villages, and villagers get increasingly urbanized and Westernized.

Political and administrative changes introduced in recent years have had important effects on the rural social structure. Most important of these are the various land reform measures including the abolition of *zamīndāri* and *ināmdāri* and the Tenancy Reform Acts giving the tenant a greater share of the produce and protecting him from eviction by the landowner. Restrictions have been imposed on the area of land a person may own. *Panchāyatī Rāj* has been introduced in most States of the Indian Union. Universal adult franchise has given the underprivileged groups new political opportunities and a sense of power.

Before Independence, even educated Indians in the towns used to invest some of their savings in arable land. Urban gentry having *pied-à-terre* was a common phenomenon. But the land-reform measures have resulted in discouraging urban people from investing in land. Even the bigger rural landowners have come to realize that it is risky to own too much land. Savings are being diverted into other channels, and the ceiling scare has resulted in the formal—and only formal—partitioning of family land to circumvent possible legislation. Land is now passing into the hands of owner-cultivators. A land-based but urban living intelligentsia will fairly soon become a thing of the past.

The enhanced powers given to village panchāyats, the abolition in some places of the hereditary principle in the holding of village offices (e.g., headman and accountant), and the Untouchability Offences Act, 1955, are all beginning to change village life. The changes will probably be more radical in the near future. The Community Development Programme, which now covers most of rural India, has made some impact on the rural population: it has made them aware of the fact that a new nation-wide organization has come into existence with the avowed aim of helping them to change their lives and economy.

Though the Portuguese built the first towns (e.g., Crānganūr) on the Western model in India, it was during British rule that the

<sup>Changing urban life</sup> Western-type town became a familiar phenomenon. Four types of towns came into existence: ports,

cantonments, administrative capitals, and industrial and commercial centres. Frequently, the British urban pattern was superimposed on a traditional town. Examples of such cultural schizophrenia are Bangalore, Poona, Ahmadābād and Delhi. In Bangalore, for instance, the traditional part of the town with its narrow, congested streets and even narrower lanes leading off them offers a perfect contrast to the cantonment with its broad and straight roads, bungalows, parks and playing fields. Again, social life in the traditional part of the town differs from social life in the cantonment.

The ports of Calcutta and Bombay have developed into huge, sprawling cities. They are an unprecedented phenomenon in India's social history. People have migrated to them not only from all parts of India but also from different cultural groups, and this has resulted in a rich and diversified social life. That a certain amount of tension should occasionally show itself between these groups, and that sometimes personal and group frustration is translated into hatred of a group, are not at all surprising. What is indeed surprising is that they are living together in peace most of the time.

During the last sixty years, several industrial towns and cities have come into existence. Some of them have literally sprung up in jungles where previously tigers roamed. India's first steel town, Jamshedpur, today employs a large number of Santals, the tribal inhabitants of that area. Now the tribes not only work in the factory but live in close relationship with groups which come from different parts of India and speak different languages. Bhadravati in Mysore State has also developed into a steel, cement and paper town in an area which was tiger-infested even as recently as the forties. In Independent India, three new steel towns have emerged: Bhilai in Madhya Pradesh, Rourkela in Orissa and Durgapur in West Bengal. These factories have not only brought prosperity but are altering the social landscape of the areas. Regions which were only recently backward, economically and culturally, are being pitchforked suddenly into prosperous, urban and cosmopolitan social life.

The manufacture of steel is not the only industry around which towns are being created. Sugar, paper, chemicals, fertilizers, textiles, and mining and dams provide other nuclei. Social life in the new industrial towns is different from social life in cities which grew around or near extant and traditional towns. In the former, the civic hierarchy shows a tendency to follow the factory hierarchy. The town is nothing more than a place where the factory workers live when they are not working. (There are, of course, small shopkeepers and others who are ultimately dependent upon the factory.) As in these towns the factory-employees live in houses built by the employers, they cannot choose their neighbours. Thus, in a textile factory near Mysore, a Brahmin may have a Harijan or Muslim or Christian for a neighbour. In Neyveli there are seven types of houses according to different income-categories. The lower income-levels tend, however, to overlap somewhat with the lower castes, and to this extent even the new towns tend to perpetuate traditional distances between higher and lower castes.

By far the most common are the "mixed" towns: the capital which is also a centre of trade and has a well known temple or two, the commercial town which is also an important railway junction and houses a big university and so on. In such a city there is usually a "core" consisting of people who have lived in it for a long time and whose way of life is different from that of the immigrants. Usually the "core" inhabit the older parts of the town while the immigrants occupy the fringe. The residential pattern of the older parts of the city shows a close relation to language, caste and religion. Even in a city such as Bombay residence is associated with these factors. Tulu-speaking Billavas holding

lower posts in offices and restaurants live in the Fort area; Mātunga and Sion are areas inhabited by Tamil Brahmins and Nāyars holding white-collared jobs; Mahārāshtrians live in Girgaum, Dādar and Shīvāji Park, while Gujarātis live in Bhuleshwar, Mātunga, Santa Cruz and Vile Parle. Muslims live in Masjid Bunder, and Goan Catholics in Marine Lines, Mahim and Bandra. Pārsis are concentrated in Dādar and a few other areas. Marine Drive, Malabār and Cumballa Hills are on the whole cosmopolitan and affluent, while industrial workers are concentrated in Parel, Worli and Cotton Green. Immigrants at lower economic and educational levels tend to gravitate to areas where their caste-fellows and language-speakers live.

In the smaller towns and cities, segregation is recognized to occur on the basis of caste. (Caste in the sense of *jāti* usually also means linguistic and religious homogeneity.) Caste enters into urban life in other ways too. In the rural areas, members of different castes are tied together by patron-client and economic ties while members of the same caste are riven by economic competition. In the towns this dependence between members of different castes is absent. The result is an increase in horizontal solidarity at the expense of the vertical. Cities are centres of caste consciousness. There is intense competition for securing educational facilities and Government jobs. Economic competition and frustration increase inter-caste tension. Where one or the other caste speaks a different language or comes from a different region, inter-caste tension may assume the form of inter-regional tension.

In understanding urban social values, it is relevant to consider the way Indian cities have grown. Usually, several villages exist on the fringe of an Indian city. As the latter expands, these villages are sucked in and the villagers lose their land. They take to new occupations such as selling milk, factory-work, domestic service and tonga-driving. The sucked-in villages present a striking physical contrast to the other areas of the city. Socially, the villagers, especially the older people, are rural in their habits and outlook. Their attitude to work, leisure, recreation, ritual, etc. is different from that of the people in the other areas. This difference often results in tension: for instance, the educated and upper class citizens in a fashionable area may value silence and privacy while the rustics do not mind noise and do not care for privacy. Again, the former are hygiene-conscious while the latter have no conception of hygiene. There are areas in Indian towns which are socially more or less rural. This is minimal in big cities such as Bombay.

Modern urbanization differs from traditional urbanization in important respects. Industrialization, which is a potent source of urbanization, has come to India from the West, Westernization and in particular from the British. It was contact with the British and the study of English that led Indians to be critical of many of their customs, manners and ideas. The English-educated in the cities are partly Westernized in their way of life: in their dress, manners, furniture, in the language they use and in the books they read. More important, it is these sections which have to some extent rejected traditional values and institutions. Such rejection is associated with education, income and, of course, urban residence. In the highly Westernized sectors of Indian society in the big cities, caste, pollution, extended kin connections, ritual and astrology seem to play a minimum part, though it is not as "minimal" as it may seem at first sight. Industrialization also means the development of what Weber calls "rationality". It means the development of discipline, punctuality, time-consciousness, hard work and acquisitiveness—attitudes which tend to increase production and profits, which in turn contribute to capital-formation. It leads to greater industrialization. So, once the people are on an industrial axis, there is no going back. Their attitudes contrast in some ways with those of villagers.

Indian urbanism is, however, not the same as Western urbanism. B.F. Hoselitz remarks, "Ahmadābād resembles much more the Manchester of 150 years ago than a modern city." This may be so in the way Ahmadābād's industries are organized and in the progress of civic consciousness, but it should not be forgotten that the culture of Ahmadābād is quite different from that of Manchester. Social life in the latter city has never been regulated by caste and all that it implies. But ethnic affiliation is important in Western cities. In the United States of America, for instance, the Whites, Negroes, Chinese, and others tend to live in distinct areas of the city. In the older European cities, Jews were forced to live in ghettos. In modern England, West Indians and East Indians are beginning to occupy distinct areas of cities. But caste is not the same as membership of an ethnic group.

Again, caste and religion tend to cut across the lines of class. A poor man may live next door to a rich man because both belong to the same caste. We have already referred to the existence of wards in urban areas, each ward being homogeneous in its caste composition. In many an Indian city non-vegetarians are excluded from some parts because the residents have a religious objection to meat-eating.

In the matter of sanitation Indian towns leave much to be desired. This is partly due to the fact that Indians carry over their rural sanitary habits to urban areas. But, as we have said earlier, the educated and high-income groups living in the biggest cities are far more urbanized than the poorer and less educated people living in the small towns. Just as there is a continuum between rural and urban life in India, there is a continuum between urban life in India and in the West. This should not be taken to mean, however, that there are no cultural and other differences between India's highly urbanized sections and people living in Western cities.

It is a popular belief that urbanization, industrialization and Westernization have secured for Indian women an increased measure of freedom. This may be true of women

Changes in the position of women of the highest castes but not necessarily of the others. For instance, women of the lower castes have the

right, given to them by custom, to marry again if widowed. Divorce is also permitted by custom. The income from the sale of dairy products goes to women. The ornaments and money of a woman pass on to her daughters after her death. In some parts of the country a portion of the ancestral land is held for the maintenance of a widowed mother, and is redistributed after her death.

It may be recalled that among the matrilineal castes on the west coast of India and among the Khāsīs of Assam it was the women who inherited the ancestral estate. Among the matrilineal Bants women are also heads of households. Among the patrilineal Nambutris, after the passing of the Nambutri Act of 1933, women had equal rights with men in the ancestral property.

It is only among the high castes in towns and cities that women lead a narrow, secluded and pollution-ridden life. Indian intellectuals coming from the urban high castes have written chiefly about this section, and it has been assumed in this connection that when rural people become rich, their women acquire the disabilities of high caste, urban women. This is one of the results of the process of Sanskritization.

During the last hundred and fifty years Hindu reformers worked hard to remove some of the disabilities of Indian women, especially those from the high castes. Satī was abolished in 1829. The age of consent for girls was raised to ten in 1860. The Child Marriage Restraint Act of 1929 laid down fourteen as the minimum age for girls. The evil effects of child marriage were publicized by reformers for decades before legislation was passed. The Hindu Marriage Act of 1955 raised this minimum to fifteen.

Upper-caste Hindu reformers also conducted propaganda in favour of widow marriage. Reformers in Bengal and Mahārāshtra led the rest of the country in this respect. It was due to their efforts that the Widow Remarriage Act was passed in 1856. The Indian Divorce Act, 1869, enabled marriages entered into by Christians to be dissolved. Under this Act, a husband was entitled to divorce an adulterous wife while a wife had to produce evidence of an aggravating circumstance such as desertion or cruelty in addition to adultery on the part of the husband. (A bill is pending before the Parliament to consolidate the marriage law applicable to Christians.)

Until 1954 when the Special Marriage Act was passed, a marriage solemnized under the Special Marriage Act of 1872 was also governed by the Indian Divorce Act, 1869. The 1872 Act was passed to enable Brāhmaṇas to solemnize marriages according to their own ritual, discarding the rules laid down by the śāstras. The Special Marriage Act, 1872, did not apply to Hindus, Christians, Muslims, Buddhists, Jains, Sikhs, Pārsis and Jews. But a large number of Hindus and others appeared before the registrars and declared that they did not profess any one of the above religions, and married under the Act. Subsequently, a Privy Council decision held Brāhmaṇas to be Hindus and to be governed by the marriage and inheritance laws applicable to Hindus. The Act was amended in 1923, and made applicable to Hindus, Buddhists, Sikhs and Jains.

The Hindu Marriage Act, 1955, includes provisions for divorce. We have already mentioned that Islām provides for divorce. Pārsī and Christian (except Catholic) marriages may also be dissolved.

European, and especially Christian, criticism of Hindu polygyny created in some educated Indians a desire to introduce legislation to put an end to it. The first attack on it was made in the Special Marriage Act, 1872. In the forties, a few States including Bombay attempted to declare bigamy an offence. The Hindu Marriage Act of 1955 makes bigamy (both polyandry and polygyny) an offence. The Special Marriage Act of 1872 also legalized marriage between members of different castes, but the partners were required to renounce their religion and membership of their joint families as a prior condition. An amendment of the Act in 1929 did not remove all the drawbacks. The Hindu Marriages Validity Act was passed in 1949 and under it a marriage between two Hindus could not be deemed invalid on the ground that the parties belonged to different castes. This Act was repealed by the Hindu Marriage Act, 1955, under which parties to a marriage need not be identified according to caste.

In the matter of property, the widow, daughter and mother of a Hindu are now heirs, with full and unfettered rights over their share of the property. In the Mitākṣara school, however, the son's right by birth in the ancestral property continues to exist. This means that the female relatives only take equal shares in the dead man's share of the ancestral property whereas each son of the dead man has a share equal to his father's.

In several parts of India, big temples had attached to them "dedicated" women who performed a variety of task : they sang and danced before the deity on certain occasions, performed certain routine menial tasks in the temple, and looked after the comfort of pilgrims, sometimes even catering to their sexual needs. Indian public opinion was roused against these temple servants (called *devadāsīs* or *basavīs*) in the first few decades of this century. The Bombay Devadāsī Prevention Act X of 1934 and the Madras Devadāsī (Prevention of Dedication) Act XXXI of 1947 declared this institution illegal.

The problem of prostitution as well as immoral traffic in women has roused the indignation of reformers all along. Several States have passed legislation to stop or reduce trafficking in women and limit prostitution.

Between the passing of laws which intend to improve the position of women and their translation into practice, there is a gulf which needs to be bridged. In rural areas girls are often married when they are less than fifteen, and widow marriage and divorce are still rare among the upper castes, especially Brahmins. Among the higher castes living in towns, the age of marriage for girls has gone up owing to a variety of factors, economic as well as social. Unmarried girls aged twenty or more are to be found in many upper-caste homes in towns. Again, the rich and Westernized Hindus living in cities no longer view widow marriage and divorce with horror. It is in this section that inter-caste as well as inter-regional marriages are beginning to occur. The laws governing inheritance will probably be more generally observed than laws regarding age at marriage. The economic interest of people will make them seek the enforcement of inheritance law by resorting to lawcourts.

Apart from legislation, the social, economic and political changes which have occurred in the last sixty years have contributed greatly to the emancipation of women. The education of women, migration into towns, the weakening hold of caste and the demand for dowry are some of the factors. Mahatma Gandhi drew women into the Nationalist Movement, and during the Civil Disobedience Movements of 1930 and 1942, thousands of women

left the shelter of their homes to disobey laws, face *lāthi* charges and enter jails. In 1937, when the Congress contested elections, scores of women stood for election to the Provincial Legislative Assemblies. One of the successful candidates became a Minister in a Province. With the achievement of Independence, several women became Ministers, Ambassadors, Governors and Parliamentary Secretaries. Hundreds of educated girls are employed as clerks, *grāma sevikās*, teachers, sales girls, typists, officials, doctors and research scientists. What is even more significant, women in the rural areas now serve as members of panchāyats and occasionally even as presidents of panchāyats.

With the emancipation of women new problems have arisen. Educated young women find the traditional type of marriage not quite to their liking. But new institutions which enable young men and women to come together and know each other have not yet been evolved. Educated girls find it difficult to live with their parents-in-law, obeying the mother-in-law at every point. They desire separate homes. When girls marry late, the conflict between competing loyalties to natal and conjugal homes becomes acute. Conflict between home-making and seeking a career also occurs. The stability of marriages can no longer be taken for granted. The changing values of women force men to change their values also.

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## CHAPTER X

### SOCIAL LIFE

#### 1. *Introduction*

IT HAS BEEN MENTIONED in the previous chapter how the majority of the inhabitants of India live in villages which are of various types ; how there is division of labour between the sexes ; how family life has oriented itself under the stress of urban forces. The reader is already familiar with a large part of the social organization of rural as well as urban India. The present chapter will accordingly limit itself to certain aspects of social or collective life which do not readily come under the category of "Social Structure" and yet form sometimes an integral part, and sometimes an ornamental fringe of the life of the people. For instance, although villages in rural India fulfil, more or less, certain common functions, their physical appearances may differ. There is also a fairly wide variety of domestic architecture which partly stems from geographical needs, and is partly related to the life and habits of the people. The furniture and decoration of houses, the dress and ornaments of the people, as also the character of various material objects in different parts of the country show a wide variety. Thus, the forms of pottery or the methods employed in their manufacture, the forms of brass utensils or the way water is carried in brass vessels, differ from one part of India to another. These are not great things in themselves ; yet, just as the dresses of men and women show an attractive diversity over the whole country, the little differences in things and in ways of doing things have a charm of their own. Those who travel over the vast tracts of India are often struck by the profusion of artistic taste with which people have tried to add a little tinge of beauty to their humble cottages and perhaps their humbler lives.

#### 2. *Villages and Dwellings*

As already stated, the villages of India can be anatomically divided into scattered and nucleated types. This point may well be pursued a little further.

In the deltaic portion of West Bengal as well as in its northern mountainous division, houses tend to be scattered over a wide area. A domicile in Lower Bengal tends to be built with a central courtyard, around which a number of separate huts are laid. The rooms face inwards. The women do their domestic work either in the inner verandahs or in the courtyard between the separate huts. While the more prosperous section of the people build houses of brick, the dwellings of the common farmer have walls of mud, or of split bamboo plastered over with mud or woven into mats which are set in wooden frames. The thatches used to be of paddy-straw; these are now being progressively replaced by corrugated and galvanized iron sheets. The materials of a house are not as important as the way the dwelling is planned. Even when a more prosperous villager builds with brick, the general lay-out is identical with the houses of his more humble neighbours. There are the same courtyard and verandahs where the womenfolk are engaged in their daily chores; in addition, there may be a terrace. The courtyard, verandah and terrace are turned into dining places during social festivities observed by almost every householder at regular intervals.

In Assam there are villages of the same kind as in the lower fringe of Bengal. Since this is a region of earthquakes, the houses have to be light and are built mostly of reeds, wood and iron-sheets. The buildings in many Districts are often artistic and pretty.

In Orissa, the dwellings have a central courtyard but the huts built all around have a joined roof, so that the structure has the look of a small square. The lay-out of the Orissa village is different from that of Bengal. The village is nucleated, but the form is linear. In this State as also in Andhra Pradesh and Madras, it is usual to build a wide street, on two sides of which huts are arranged in long and parallel lines. It is not unusual in Orissa to have several such parallel streets; one or two of them may even run at right angles. And these separate streets may be the abode of different functional castes.

Since the domiciles are contiguous, often with high verandahs, one can cover almost the length of the whole village by walking from one verandah to another. One difference between villages in Bengal and those in Orissa is obvious. The artistic traditions of Orissa have been richer and have persisted in their wholeness by virtue of the prolonged freedom of this land from the kind of political disturbances to which Bengal was subjected from time to time. An Orissan housewife decorates the outer walls of her

dwelling with simple and beautiful drawings made by hand, in which occasionally a stencil is employed, or a particular kind of fruit with an ornamental cross-section is dipped in colour and used as a stamp.

All over Andhra Pradesh and Madras, as well as in Mysore and Kerala, it is usual for women to clean the street in front of the house by smearing it with a wash of cowdung Southern India and then draw certain beautiful designs every morning with white or coloured powder. In Orissan homes, we find in addition, in some of the more prosperous dwellings, coloured drawings of various kinds for which professional painters are employed. The subjects may be the lucky sign of earthen pitchers filled with water and with fish alongside, women welcoming guests into the house, moustached musketeers on guard, and so on. Uttar Pradesh and Rājasthān also have occasionally such decorations added to the front wall.

The huts of the Shānār or Nādār peasants in the extreme south of the Peninsula are decorated with broad parallel bands of white and red on the earthen plinth. Santāl women use washes of red and black for the decoration of their houses. Elephants with riders, horses and tigers, or simple representations of flowers done with an unsophisticated hand, lend an added charm to many house walls of mud.

Kerala and Mysore are more mountainous regions, different from the flat alluvial plains of the eastern border of the Peninsula. In Kerala, houses may be nucleated in the neighbourhood of roads; but, on the whole, they are scattered. Each domicile is composed of one or more huts and surrounded by its own garden of fruit trees. There is a striking similarity between Kerala villages and villages in the maritime Districts of West Bengal. The similarity with villages in Noākhāli or Southern Barisāl in East Pākistān is even more striking. But there the parallelism ends.

Kerala, unlike Northern India, does not suffer from the *pardāh* system. Andhra Pradesh and Madras also are free from it, and so are Mahārāshtra and Gujarāt. The result is that the seclusion attained by having a central courtyard, with the backs of houses turned towards the streets, becomes unnecessary. Courtyards, if they exist at all, are in front of houses. In many parts of Andhra Pradesh, for instance, the open wide street between two rows of houses is often the place where women in a fishing village spread out their fish in the sun for drying, or the weaver stretches his varn for sizing, or the oilman turns his press, his bullock making its slow round.

Villages in Gujerāt are also nucleated and linear as in the rest of the Peninsula. But this area suffered often from pirates and nomadic tribes, with the result that many of its Western and Northern India villages had protective walls all around. Moreover, there were often wooden gates and heavily nailed doors set in the middle of the roads; these could be closed in order to protect the inhabitants, when one section of the village fell to the attack of enemy bands.

The needs of defence have given a special character also to the villages and towns of some parts of Rājasthān, Western Madhya Pradesh and North-western Punjab. Where life is disturbed by hostile raids, there is agglomeration; this has often resulted in a crowding of houses without any plan whatsoever. It has given rise to a form without design and without beauty. As organized government succeeded the anarchy of post-Mughal decadence, the walls of fortified towns and villages tended to disappear. But where the walls and gateways were powerful structures of stone, citizens who hardly owned any property built their hamlets outside the city walls; in consequence, many North Indian villages and towns on the disturbed western borders make an ugly blotch in the landscape.

It may, however, be pointed out here that some old towns were more carefully designed and laid out. The water-supply was assured through wells as well as large tanks, decorated by stone staircases and bordered with trees which afforded shelter to those who came to the cool confines of their neighbourhood. Jaipur, Pushkar and Ahmadābād, and other ancient towns of Rājasthān, Madhya Pradesh and Kāthiāwār bear testimony to this desire of laying out cities with a sense of beauty; but, then, in the rapidly fluctuating military fortunes of these regions, this was not always possible.

Ancient canonical works on architecture contain rules for the lay-out of villages and towns. The orientation of houses as also the width and direction of roads are described in detail.

In this connection there are certain points which should be borne in mind. The distinctions indicated above are principally on the basis of geography. One part of India differs more or less from another in regard to the lay-out of villages and also of domicile. But it is interesting that even within the same State there may be a distinction between one social class and another, between "upper" castes and "lower" castes, between the wealthy and the poor. It is not necessary in a brief review like this to indicate all such distinctions. But perhaps it would be proper to

indicate that nucleation or the dispersal of houses is a matter of degree. Even where the prevailing type of village is nucleated, there may be semi-attached or detached houses or huts; the difference being occasionally caste-wise. Some of the "low" castes may have huts detached from each other; certain artisan castes may cluster together even where the village is mainly of the dispersed type.

### *3. Decoration and Furniture*

In India's climatic conditions there is no great need of furniture. A few mats, string bedsteads and some other simple items are all that the village seems to require. Even in such circumstances the variety and richness of taste displayed is of an amazing quality.

The swing takes the place of an easy-chair in homes throughout the western States of the Peninsula as well as in Madras. In Interior decoration Gujarat, and formerly also in Sind, these swings, set on wooden stands or suspended from the ceiling by iron or brass rods are highly ornamented with lacquer-work; and it was often the custom previously to provide a newly-married couple with a costly swing of this kind.

Women in India, as everywhere else, love to decorate their homes. The means employed in different parts of our country show a wide range of variation. In Gujarat and Mahārāshtra, there is often a carefully arranged display of shining brass utensils in specially designed cupboards. In Andhra Pradesh, even in a household of moderate means, rows of pictures of gods and goddesses or of photographs of one's kinsfolk arranged with some kind of design are used for the purpose of decoration. A wealthy but not westernized house has, in its sitting room, more of mattresses and bolsters than chairs and tables. Signs of wealth and comfort, they add an element of beauty to an uncrowded room.

The dress and ornaments of India need not be dealt with in detail. Certain features common all over India may be noted.

Dress and Ornaments In South India one is expected to take off a sewn garment when entering a temple. Even in the North, sewn clothing, though in common use, has not attained ceremonial or ritual sanction.

The head-dress is used in the North as a sign of distinction and taste. The turban of Bikaner is different from that of Jaisalmer, and both are different from that of, say, the Mers of the

Kāthiāwār peninsula. Every region, and sometimes even castes, have their own special ways of tying the turban; so much so, that a man's domicile may be conjectured from his dress, just as the sect to which he belongs may be recognized from the paste-mark he wears on his forehead. A worshipper of Rāma and of Krṣṇa may thus be distinguished.

The unsewn garments worn by women also vary widely from one part of India to another. Some regions like Kerala prefer white; Madras seems to have a liking for brightly coloured *sārīs*, blue, green or different shades of red. North India has bright colours in some parts; but softer shades which melt into one another are perhaps considered more aristocratic.

Ornaments are of many varieties. The most common ones appear on arms and ankles, while there are also various kinds of rings for the ear-lobe, nose and toes. The heavy ear-rings of Southern Madras distend the ear-lobe to an abnormal size. The Lambādis of Western India cover the whole lower and part of the upper arm with heavy bracelets of ivory, under which it is not unusual for the muscles to get thin and emaciated. Orissan women of certain castes wear brass bracelets and anklets in almost the same manner. However, such customs are disappearing with changes in taste and working habits. The recent use of shoes among women in Bengal, for instance, has led to the virtual disappearance of ankle-ornaments and toe-rings.

#### *4. Other Material Arts*

Other arts of life include agriculture and pottery, metal-work of various kinds, weaving and leather-work. India has always been famous for handicrafts. One of the chief attractions of foreign traders in this land has been the excellence with which some of these finer arts are carried on to the present day. Certain features of some of these simple, everyday arts may be briefly considered.

Nearly half of India's population subsists on rice or its poorer substitutes. The other half depends on wheat, barley, maize or millets. On the whole, there are two main ways in which food is processed. Rice is boiled, or it is ground into flour and steamed or converted into a flat pancake. Those who live in the rice-zone of India, and yet cannot afford to procure anything more than its poor substitutes in the form of some millets, also cook the millets in almost the same way. In the wheat zone, cereals are ground into flour and turned into unleavened bread. It is only

in the extreme west and north-west that a little fermentation is permitted in the dough, so that the bread rises not only through the liberation of steam as in unleavened bread, but through a slower process of liberation of carbon dioxide.

What is interesting from the anthropological or historical point of view is that many of the processes of either cultivating or cooking rice indicate a cultural relationship of India Diffusion of culture with countries in South East Asia, as well as with

China, while bread and its associated processes establish its kinship with countries lying towards the west and north. This is natural ; but it is perhaps worth while to remember that there are also other indications of such connections. For instance, ploughs from Japan down to the Philippines are drawn by one buffalo alone and the yoke has a very special structure. Further down in Java, the ploughs are drawn by two animals and the harness seems to have a closer resemblance to that used in India. In Java buffaloes may be supplanted by oxen ; and at least in one part of that country the oxen have been known as *Bangala*—the breed may have originally gone from Bengal.

It would indeed be of great interest if the history of the diffusion of these arts could be unravelled, for they would open up new ways of establishing the cultural relationship of India with other lands. What is of still greater importance is that India shares some elements of religious faith and practice with her eastern and south-eastern neighbours ; and some of the knotty problems in our social history may perhaps be unravelled by this kind of investigation.

Let us consider a few examples before we pass on to the ritualistic and ceremonial aspects of social life with which the material arts are quite often closely interrelated. In Assam a caste of potters, known as the Hira, manufacture pottery not by means of the wheel, but simply by beating the clay with wooden bats and dabbers. Some of the north-eastern Nāgā tribes have a parallel method of pottery-making. In Java pottery is made by hand as a lump of clay placed on a wheel is turned slowly by means of the toes, the wheel serving the purpose of just a turn-table. Evidently, these methods of making pottery by hand point to a continuity across the frontiers and cannot be a matter of mere chance. Anthropologists have often drawn attention to such historically significant localized distribution.

Orissa and Andhra Pradesh as well as Madras are reputed for fine silver filigree ornaments. In the first two States, beautifully carved toys are made of buffalo horn. Almost the same patterns, and certainly the same skill are in evidence in some of

the South East Asian countries. Buddhism and certain forms of Hinduism were carried by Indian merchants and princes into the Eastern Archipelago. Could it be that both the regions built up common traditions and comparable skills in regard to particular kinds of silver-work or work in horn and bone? It is impossible to say who was the debtor and who the creditor.

Apart from the historical interest with which some of the material arts of life may be viewed, it is worth-while to remember that within India itself a large amount of differentiation has taken place in all these fields.

There are several breeds of cattle in India. Kāthiāwār and Punjab have special varieties. Mysore has a typical variety of horned bulls, represented in temple sculpture dating back at least to the 11th or 12th century A.D. All these types have been stable and recognizably different for nearly eight or nine hundred years.

Along with the differentiation of cattle, there has been a parallel proliferation of bullock-carts. Orissa, Andhra Pradesh and Madras have bullock-carts with large wheels about 1·37—1·52 m. in diameter. The Orissan cart-wheels are thin and light while those of Andhra Pradesh and Madras have a broader rim and are heavier. Mahārāshtra has produced several specialized kinds of carts, drawn either by single or by double bullocks, for carrying goods and passengers. Some of these bullocks can run very fast; and races are arranged between bullock-carts on festive occasions.

With a long history of peaceful pursuit of the arts and crafts, India has slowly given rise to an amazing proliferation of styles. This proliferation has lent a charm to the variety of implements and other objects used even by the poorer inhabitants of the land; the drabness of common objects is often relieved by a true sense of beauty.

### *5. Rituals and Ceremonies*

Perhaps what has been said of average Indian life is also true in respect of the life of people all over the world. People everywhere have to undergo the inevitable round of hardships and disappointments. When men succeed in finding a way of living and in bringing some comfort into their household, they experience a sense of fulfilment, because of which the simple acts of sharing meals at home or of caring for the children become invested with a new set of values.

India has often been accused of weaving religion into every

detail of daily life. But then, what harm is there if the life of man, from birth till death and even beyond, is turned into ceremonies or sacraments by the addition of little touches of beauty and of holiness ?

The previous chapter has dealt with the scientific aspects of family life, namely, how it is formed, its different kinds, fluctuations in its composition under conditions of rural and urban life, and the manner in which authority is distributed. It is unnecessary to enter into these questions once more. It may, however, be useful to indicate some of the ritual acts which punctuate the life of an average Indian within his family surroundings and to note the purpose which these ceremonies serve.

In Hindu villages throughout India there is, more or less, a common attitude towards a woman with child. Several taboos are applied to an expectant mother. She is forbidden to go to each and every place. She must not move about at particular hours of the night lest evil spirits, which are supposed to be always on the prowl, do her harm. At the same time, her domestic chores are lightened. In Bengal, the expectant mother in her seventh month receives various gifts and the food she eats is prepared specially to suit her taste. Delivery is followed by worship of the deity who presides over the natal event. Children of the neighbourhood are invited to merry-making and are given sweetmeats and a little cash. When the infant is six months old, it is fed for the first time with rice in a formal manner ; this again is an occasion for merry-making, amidst the blessings of elders.

When the child is five years of age, he goes through the ceremony of worshipping the Goddess of Learning : he scrawls his first alphabet with a piece of chalk, as a sign of initiation into the mysteries of writing. A girl does not usually go through that ceremony ; but in towns now a days it is not uncommon for a little daughter to be treated on the same level as her brother.

Not so long ago, marriage of girls took place before puberty. But after the nuptial ceremony a girl stayed in her parental home until she attained puberty. That occasion was openly proclaimed. On receiving the news, her husband's people would send her various gifts. The first bath after menstruation was a ceremonial affair, when perquisites were due to the washerwoman and the barberwoman.

The sociological as well as the ritualistic aspects of the marriage ceremony have been dealt with in the previous chapter. Marriage in India is a concern not merely of two individuals—it sees two families formally united. A ceremony brings together a

large circle of kinsfolk. The bride and the groom receive numerous presents which help them to set up a new home.

Death is also accompanied by various rites. Not so long ago, the dying were taken to the bank of a river ; and even now there are cases in which the dying man himself wishes Funerary cere- to be taken to a holy stream so that he may expire monies with his hand touching the sacred waters.

Funerary ceremonies are often elaborate ; and when at the end of a period of mourning *śrāddha* is performed, there is a round of worship and offerings. This is an important event in the family's life and in the life of the village as a whole.

In India, as also in China and Japan, it is believed that the spirits of the ancestors remain concerned about the welfare of their descendants. Offerings have to be made to them on prescribed occasions. Pilgrimages are undertaken in order to repay the debt to those who are no more. In the homes of some tribes like the Santāl, Ho and Juāng of Eastern India, there is often a small shrine in the kitchen or at a corner of the living room which is regarded as the residence of the ancestral spirits. While the memory is fresh, special offerings are made in the names of particular ancestors. Thus, for instance, in the case of one tribe, it was observed that a few leaves of tobacco were placed as an offering because the individual in question had been fond of smoking.

This concern for the dead is an indication of the fact that the Indian considers himself to be in continued connection with those whom he cannot see any more. With such a support, even if it is of an imaginary nature, life perhaps becomes somewhat easier to bear.

This feeling of continuity with the dead finds a peculiar expression among some of the tribal people. It is believed that when a child is born, one of the dead ancestors has become incarnate in him; and that the identity of that ancestor can be determined by means of divination.

#### *6. Recreations, Old and New*

We may now turn our attention to another aspect of social life, namely, the various ways in which recreation is organized in both villages and towns.

India has always specialized in such sports as wrestling and bouts with pikestaff, in which very little equipment is needed.

Among the peasantry of Uttar Pradesh and Punjab in particular, wrestling is a very popular sport. In winter it is not unusual to find young men wrestling with one another in the hard Games and Sports vested fields. The cowherd caste of Ahir or Goālā is reputed in many parts of India for skill in *lāthī* or pikestaff play. There is a festival in which cowherds gather together, and the caste panchāyat also holds its session. On such occasions an item that enlivens the meeting is the display given by young and old in *lāthī* play. There are also more exciting varieties of sport. A favourite game of peasants in the Midnapore District, for instance, is to excite a bull until it chases its offender in a rage. The man tries to avoid being gored. This continues until the animal gets exhausted and retires.

Among the more common sports, there is kite-flying. It is a favourite pastime over an extensive area of Northern India. These kites do not have the elaborateness of design as in China; yet the skill with which one kite-flier tries to "cut" the thread of another provides ample excitement to the numerous spectators who patiently watch the game.

Games with balls of various kinds are an introduction from the West, although polo seems to have had its origin in the East. Among these, football, hockey and basket-ball have become fairly common even at the village level, though they are mostly confined to schools. Curiosities like cock-fighting or the fighting of *bulbuls* and rams are restricted to particular communities and areas; they often provide an occasion for betting. Cock-fighting is one of the favourite sports of the Eastern Archipelago as well, and its restricted distribution in Eastern and some parts of Southern India may be an evidence of historical connection between the two regions.

The country theatre without a stage and professional story-telling are common in many parts of India. There are wandering story-tellers who visit the villages; in course of the recitals, presents in cash and kind are offered to them by the audience. The stories, recited or sung, are drawn mainly from the Epics and the Purāṇas. And it is chiefly from these sources that an Indian boy receives his introduction to India's sacred lore. Regular readings from the epics are arranged in a temple, or by the side of a bathing *ghāṭ* near a river.

There is a rather unusual community of professional story-tellers in the District of Midnapore in West Bengal, the Pātidārs. They have Hindu names but their social ceremonies are presided over by Muslim divines. They are thus neither fully Hindu nor

fully Muslim. The pātidār is, first of all, a professional painter ; by way of depicting the story, he draws a long series of pictures on a roll of cloth wound over two wooden rollers at the ends. As he sings his story, he goes on unfolding the painted roll in front of his audience with dramatic gestures. Such recitals were very popular at one time; but with itinerant companies offering cinema shows in tents even in remote villages, the appeal of the professional story-teller has decreased considerably. This may be due to the fact that the cinemas offer evernew stories, and attract the rural folk by their novelty, while the caste of minstrels has nothing equivalent to offer in comparison.

A dying institution is the competition between bards—they try to beat one another by asking questions through verses composed on the spot. The audience enjoys the skill and rapidity with which one versifier composes his question and the other not only flings back his reply in verse, but adds to it some question for his adversary to answer.

Dances are a popular feature of entertainment all over India. The *Bharat Nātyam* of Madras and the *Kathākali* of Kerala are famous. These are special modes prevalent either Dance and Music in temples, or popular as methods of recital of tales even in the country-side among rural folk. North India has also its specially sophisticated styles which once reached high development in the courts of kings and nobles. Each of these various orders has its special repertoire of poses or of movements which can be knit together in order to give expression to a story.

Apart from these sophisticated styles in which the chief part is played by specialists, there are simpler forms of dance and music in which even the unskilled can participate. These may be designated as folk-art, in contrast to the forms which require the services of a specialist.

Gujarāt has a wide repertory of folk-dances in which both men and women participate. Some of these are performed when the rains come ; some depict scenes from the epic tales of Kṛṣṇa's playful activities in Vrindāvan. Rājasthān and Gujarāt have many elements of fine arts in common. An occasion such as marriage is marked by teams of brightly dressed women marching through the village singing songs. In the past such choruses were more widespread than they are today. They are still extant among villagers even in Bengal, where they have almost disappeared in towns and areas under urban influence.

In contrast to the more sophisticated sections of the people, the tribal population has still preserved a large measure of its

indigenous dances and music. The dances of the Santāl and Mundā of Bihār and of the Bison-Horn Mariā of Madhya Pradesh, as also some of the vigorous war-dances of the tribes inhabiting the North East Frontier Agency are among the best that India has to offer. In Orissa, the more sequestered tribes offer the novelty of mimicry ; the dancers imitate the vulture and its prey, or utilize other themes of that kind.

In rural India men and women participate freely in several classes of singing. These and other forms of aesthetic expression may not reach high technical excellence, but the spontaneity and the down-to-earth quality, against a background of refined colour combination or form, are notable.

### *7. Festivals, Fairs and Pilgrimages*

Rural India has festivals of many kinds. Some are connected with eclipses, or take place when the Sun and the Moon change their position among the heavenly bodies, while some Festivals are associated with the oncoming of particular seasons. The number of gods is legion, and they either belong to heaven or have a more humble origin. There are festivals connected with the worship of Viṣṇu, Śiva or Durgā, and are observed in many parts of the land. Local festivals stemming from the worship of cows and oxen, or of monkeys and snakes, of plants like cocoanuts, the sacred basil or the sacred fig tree are also fairly common. But these are of more restricted, local distribution.

It is natural that a farmer has festivals connected with the first ploughing, sowing or harvest. Fishing folk on the eastern coast of India offer prayers to the deities who reside in the ocean before they cast their nets for the first time at the commencement of a season. Viśwakarmā, the Architect of the Universe, is a deity worshipped specially by artisans—carpenters, blacksmiths, and braziers. During the celebration of Viśwakarmā Pūjā, even workers in industrial establishments often clean their machines and offer a brief worship within the factory precincts. It is hardly necessary to describe the ritualistic aspect of these festivals, but the significant part which festivals play in the social life of the people may be noted.

Fairs and festivals draw together the people of a neighbourhood, and community ties are strengthened by common

participation. They also offer opportunities for buying and selling special kinds of commodities. Fairs spring up when thousands of pilgrims assemble at prescribed times on the banks of a holy stream or at a place which has a celebrated temple. They attract merchants and artisans and good business is done. There are great fairs which draw people not only from the neighbourhood but from almost all parts of India. Goods thus get distributed throughout the country. While a weekly market caters to the needs of a small locality, a fair covers a very large hinterland. Specialized craftsmen find it difficult to sell their wares all through the year; the annual fairs offer them a suitable outlet for their surplus products. In the months of winter, after harvest, fairs are held at various places in such a manner that craftsmen find it easy to move with their goods from one fair to another until their stock is exhausted.

An agriculturist cannot afford to make purchases all through the year. In winter he has cash in hand, and travelling is comparatively easy. There are famous fairs specializing in particular kinds of commodities. The fair of Sonpur near Patna, for instance, is renowned for the sale of cattle, horses, elephants and camels. At Kalisunri in East Pākistān, thousands of wooden boats are brought for sale; before India's Partition buyers went to Kalisunri from practically all over the riverside villages of Bengal.

A fair is often connected with a pilgrimage. A sparsely inhabited place takes on, almost overnight, the semblance of a teeming town. When the fair is over after a week, or sometimes even a month, the large concourse of people disappears completely, to meet once again in the following year. From the geographer's point of view, this is an interesting phenomenon—he may regard a fair as a transient town. Perhaps, if the pilgrimage becomes sufficiently attractive, and if festivals follow one another in unbroken succession, a permanent town grows up on the spot. One can imagine that ancient cities like Vārānasi, Gaya and Allahābād might have had as their nucleus some ancient fairs of this kind. And when a place was found suitable for the purpose of trade, it could grow into an important business centre. It could even catch the fancy of a king and become a capital city.

All of India's urban centres did not grow up in that way, but a few undoubtedly did. And it is of significance that, even in the early centuries of the Christian era, when Vātsyāyana's

*Kāmasūtra* was composed, the city was regarded as the model of cultured life; the *Nāgaraka* was a man of refined taste, skilled in the art of enjoying the pleasures of life.

It is interesting to note that the Muslims and Christians in India have their own pilgrimages, even if these do not play the same role in their lives as in the life of the Hindus.

In spite of the division of India into many linguistically, and sometimes culturally, distinguishable regions, it is significant that every Hindu sect has had for centuries past centres of pilgrimage distributed over the whole of the land. Śaṅkarācārya is reputed to have founded four monasteries which are located at the four corners of India. Joshi Math lies in the Himālayas; Sāradā Math at Dwārka, on the western tip of the Kāthiāwār peninsula; Govardhan Math at Puri, on the shores of the eastern ocean; and Sringeri Math on the Western Ghāts in Mysore. These monasteries are held in the highest reverence by all Hindus.

People of the Śākta sect have more than fifty centres of pilgrimage scattered throughout the country. There are twelve “effulgent images of Śiva” called *Jyotirlinga*, distributed over the country. When the worship of Sūrya, the Sun God, was in vogue, and had not become wholly merged with the worship of Viṣṇu, there were seven places of pilgrimage sacred to that God. These were at Multān in West Pākistān, at Vārānasi, and in North Bengal, Orissa and perhaps Gujarāt. When a pilgrim in Bengal takes a holy bath as the Sun enters Capricornus or *Makara*, he is supposed to place upon his head in salutation seven leaves of the *arka* plant (*Calotropis gigantea*), the term *arka* standing both for the plant as well as for the Sun.

For more than 2,000 years pilgrimages helped to deepen the realization among the people of India of the cultural unity of the land, in spite of the political divisions. Certain picturesque rites and practices have helped the process. For instance, when a pilgrim visits the southern end of the land at Rāmeswaram or Cape Comorin, he fills a small vessel with sea water—this he hopes to carry one day to the holy shrine of Badrīnārāyaṇ in the Himālayas where he can use it for the worship there. Pilgrims to Puri from Uttar Pradesh often carry away with them bundles of cheap cane-sticks as sacred mementos; these find their way eventually to a shrine on the banks of the Yamuna in Vrindāvan. Visitors to Gaya and Allahābād offer oblations to their ancestors in the sacred Sanskrit language; and whether they belong to Kerala or Assam or Mahārāshtra, they do not have any feeling that they are in alien surroundings. It is still Bhārat, the holy land of innumerable pilgrimages.

### 8. Ideals in Social Life

The sense of cultural unity developed through the institution of pilgrimages was further reinforced by another institution which has had an equally remarkable influence on the social life of the people of India. One of the stages into which life is divided, according to the Hindu scriptures, is *sannyāsa*. It is the fourth stage of an individual's life, and is preceded by *brahmacharya*, the students' stage, *gārhasthya*, the householders stage, and thence through *vānaprastha*, the stage of retirement to the forest, on to the final stage of *sannyāsa*. *Sannyāsa* used to be the last stage of a man's life. Śaṅkarācarya turned this into a mendicant's order, perhaps in imitation of the organization of the Buddhist Church.

What is of significance from the social point of view is that a true *sannyāsin* should be a homeless wanderer, attached to no name or place. When a person is initiated into this order, no matter whether he subscribes to the Advaita or Dvaita philosophy, or to the faith of the *Vairāgins* or of the various *Panths* which grew up in medieval India, he has to wander about as a mendicant and never to indicate the place or the caste to which he originally belonged.

The casteless *sannyāsin* is beyond the compulsion of civic duties to which an ordinary citizen is subject in accordance with his birth in a particular caste and station in life. He is even nameless. These mendicants, dedicated to spiritual pursuit, which may or may not lead them to a life of social service, go on a round of pilgrimages, or retire to some secluded spot for a life of meditation. Yet, householders come into frequent contact with them and imbibe from these transitory contacts what is often best in the civilization of the land.

The Buddha was one of the greatest of India's holy wanderers, and so were Śaṅkara, Nānak and Caitanya in later times. Each one of them covered large tracts of the country as do some of their humbler countrymen even to the present day. Not very long ago an old gentleman traversed the length of the road from Calcutta to Puri, a distance of nearly 500 km., by prostrating himself all along the holy road. It took him nearly three years to complete the journey. People regarded him as an ascetic who had to be honoured and welcomed wherever he went. For the pilgrim himself, however, the road was too holy to tread and he could only salute it all along its length. Had not pilgrims like Caitanya and his companions made it sacred with the dust of their feet?

It is important to understand this aspect of India's social life. Caste and the ritualism of Brahminical religion bind a man's life in a kind of total subordination. Changes brought about in modern times have hit hard at that iron bondage. But it should be remembered that while caste and sacred ritualism—let us call it "priestcraft"—bound the hands and feet of men, it was possible for them to escape from this social totalitarianism into regions where the mind and spirit could soar high in freedom. And what is significant is that this freedom could be attained by anyone who was willing to forfeit the security and profits assured to him by social conformity.

It is of great significance that the rigidity of Hindu society, to which even Muslim and Christian sects in India have occasionally succumbed, was tempered by its polar opposite, namely, utmost freedom of the mind, for which the price had to be paid in terms of asceticism. This freedom, which was granted to aspiring souls held in reverence, made it possible for India to welcome all alien faiths and alien cultures; and she did so, not with a sense of condescension or tolerance, but with the highest respect due to any faith which sustains a community and yet does not injure others. This idea of regarding all faiths as worthy of reverence, along with the feeling that men's views of reality are, after all, partial, has led to a kind of spiritual democracy of faiths in India; and this has been one of the major contributions of Indian civilization to the civilization of mankind.

No one will deny that this recognition of all faiths which do no harm to others is great as an ideal in itself. But the charge might be made that this had led to the separatism underlying caste, and does not explain what justification was found for the hierarchy and class-character underlying that system at the operational level of life.

There is indeed no justification. In fact, as one observes how Brahminical priesthood became firmly entrenched in its privileges in course of time, and also how accretions to the Brahminical social order were, almost all, relegated to the lowly, unprivileged stations in society, one is deeply distressed by the manner in which Indian history has gradually unfolded itself. The spiritual equality based upon the Vedānta became corrupted at its base by the dust and mire which welled up from lowly human nature. The ideal which bound together faiths at the highest level became murky as it was formalized through the structure of caste.

One may have one's own complaints, and one may also sympathize with the pain and suffering of those who wish to bring about conditions of social equality in this ancient land; yet, unless

there is knowledge and understanding of the ideals and historical forces which shaped the social life of India in the past, one is more likely to end in disappointment and frustration than otherwise. Perhaps a clearer appreciation of the ideals and actualities of Indian life, many of which still remain in operation today, may furnish us with knowledge that is likely to be of inestimable help in our desire to bring about necessary reform.

### 9. *The Changing Scene*

The account of India's social structure both at the rural and urban level given in the last chapter furnishes us with a description of the facts of such life. We are told how men are tied to one another by various forms of exchange of services, which might be both secular as well as ritualistic in nature. Corporate life is carried on under various institutions like the panchāyat; and it has been shown how the character of the panchāyats is being altered in recent times. In addition, it has been explained how villagers try to lighten the load of their lives by several forms of co-operation either at the level of kin-grouping or of neighbourhood relationships.

In this account is presented no more than a generalized view of some aspects of social life which are either functionally significant, or which are the utilitarian or ornamental products of collective living.

It would be worth-while to draw attention to one rather generalized feature of the kind of change to which Indian social life is being progressively subjected. It was indicated that under the arrangements of India's productive organization and its ritual counterpart, the life of the individual was very much subject to totalitarian control. But the individual could escape from this subordination by taking the life of *sannyāsa*. Of course, the number of those who have conformed has been always very high in comparison with those who have dared to differ. As a result of this extreme conformism and of identification with a group, a man is regarded less for what he is worth on his own account and more as a member of the group to which he belongs. It is easier perhaps to deal with persons when we can locate them in one class or another, than to adjust ourselves to the innumerable varieties of individuals under conditions in which individualism is allowed free growth at various levels. In the caste-ordained life of rural India, therefore, a man is regarded first by his group

identification. What is noteworthy, however, is that as there is a growing mobility of occupation and an increasing freedom of movement from village to town, or from one part of the country to another, men are being progressively emancipated from the bondage to caste identification. People still have caste. As a matter of fact, caste has begun to throw down new roots into the earth—for instance, by infiltration into the politics of election. Yet, when we consider the over-all picture, the individual has been registering an increased degree of emancipation at the ordinary secular level of life. This was denied to him under the old order at the everyday level of life even while freedom of spiritual enterprise was fully guaranteed.

Perhaps the most noteworthy feature of India's changing social life is the increasing emancipation of the individual in the secular, social aspects of his life. This is true of men both in villages and towns; only the degree of freedom attained may be unequal, or may vary in different parts of the country.

Whether this is due to the spread of Western education or not is an open question. Education itself has failed to reach large sections of the population. But one thing is certain. The productive organization of India was subjected to hard change under the British rule. Free India has not altered the direction of that change, although the desire is there to bring production under public control, a measure which has already been largely attained in many countries in the West. And the philosophical basis or implication of this altered ideal is already becoming manifest in the stresses to which social life is subjected in India today. The increased individualization evident at the secular level can therefore be looked upon as a by-product of the profound alteration which has come over in India already, first under the stress of Western domination, and now through the willing consent of the people of India themselves.

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## ERRATA

Page 100, line 23, read 'change' for 'changes'

" 134, Box, read 'Talchir' for 'Talachir'

" 180, line 34, read 'Labiatae' for 'Labiate'

" 348, Bibliography, lines 9-10, read 'People' for 'Peoples'

Pages 419 & 439, read 'İśa Upaniṣad'

Page 439, line 37, read 'Ramana Maharishi'

" 447, line 3, read 'Brahminism' for 'Brahaminism'

" 449, line 34, read 'Bodhisattva' for 'Boddhisattva'

" 451, read 'Tāntric' for 'Tāntrik'

" 496, line 38, read '10,728,086' for '10,528,063'

" 499, Bibliography, read '*al-Quran*' for '*ul-Quran*'

" 544, line 32, read 'for' for 'of'

" 556, line 43, read 'grandparents'

Also read :

Page 135, line 26, 'fragmentation'; page 167, line 26, 'cardamom'; page 362, footnote 'achieve'; page 417, line 33, 'doctrine'; page 424, line 9, 'differentiation'; page 486, line 10, 'present'; page 580, line 37, 'domiciles'.



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